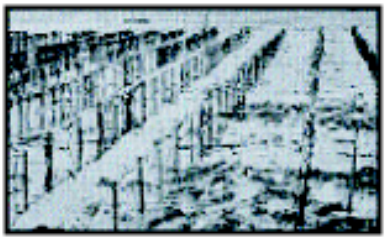
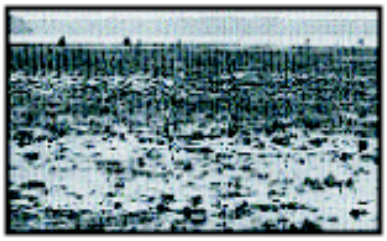
Draft Program Environmental Impact Report
for

Coastal Marine Aquaculture Projects








January 2003

Prepared for:

California Department
of Fish and Game

Prepared by:

FishPro, Inc.
and
ENTRIX, Inc.

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Prepared for:

California Department of Fish and Game
Sacramento, California

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SECTION 1. EXECUTIVE SUMMARY

This Program Environmental Impact Report (also referred to as a Program EIR or PEIR) is intended to serve as an aid to applicants of new marine aquaculture projects in California or those making changes to existing projects. It is also intended that this document serve as a learning tool for project reviewers who may be unfamiliar with the range of activities in the aquaculture industry. From a technical standpoint, this Program EIR is a "first-tier CEQA document". Tiering is a method that strives to streamline the environmental review by providing an initial document that analyzes broad issues of a program. As an approved CEQA document, this PEIR may be incorporated by reference into subsequent "second-tier" environmental documents prepared for individual aquaculture projects. This approach allows the second-tier analysis to focus only on the impacts of the individual project. Depending on project components and complexity, the product of the second-tier analysis for an individual project will be a Negative Declaration, Mitigated Negative Declaration, or an Environmental Impact Report.

California has the most diverse aquaculture industry in the United States. The state's size, combined with its particular geology and topography, provide a multitude of climatic and water conditions suitable for a variety of growing conditions. In recent years, about 50 to 75 percent of the state industry value has come from the production of fresh water food fish, including catfish, striped bass and hybrid striped bass, tilapia, sturgeon and trout. About 10 percent of the value is derived from marine shellfish, primarily oysters and abalone. Most of the remaining value comes from a variety of non-foodfish products such as baitfish, ornamental fish, and algae developed for use as a nutritional supplement or food additive. While a vast majority of California production involves common aquaculture products, it is worth noting that numerous other species are currently cultured to a lesser extent or have strong candidate status based on successful culture in other parts of the world.

Aquaculture projects can generally be categorized by the method used to rear the product. Several of these methods are appropriate only to marine species reared in coastal environments, while other rearing methods are used only for freshwater species in an inland setting. Regulations that govern these two broad geographic settings are often very different, particularly with respect to protection of resources within those environments. For this reason, two programmatic EIRs have been prepared to address the California aquaculture industry: one for coastal marine projects and one for inland projects. This PEIR pertains to coastal marine aquaculture projects.

Five categories of marine aquaculture production have been defined in this PEIR based on distinguishing characteristics of the physical and/or operational setting of each method. These five methods are:

- bottom culture
- off-bottom culture
- floating cages
- submerged cages
- land-based tanks

Bottom and off-bottom culture have been the most common methods of marine aquaculture in California, used for the grow-out of oysters, mussels, clams and scallops. Floating and submerged cages are typically used for the grow-out of finfish, though in California they have also been used for abalone culture. Land-based tanks are used for early rearing for nearly all cultured marine species, as well as for grow-out of certain species such as abalone. Greater detail regarding both the typical physical components and standard operating procedures for each rearing method is presented in Section 3 of this PEIR.

Aquaculture is a heavily regulated industry in California and in the United States in general. First and foremost, every proposed commercial aquaculture project in California must be approved by the California Department of Fish and Game (CDFG). An initial step in the aquaculture permit process involves a screening of the species to be reared. If the proposed species raises concerns relating to issues such as (but not limited to) introduction of exotic species, escapement, and disease transfer, CDFG will identify additional operating conditions and permits that must be addressed prior to final project approval. Section 2 of this PEIR provides a discussion of specific aquaculture activities that require additional permit approval, and in this way suggests methods a project can be operated to avoid or minimize certain potential impacts.

Additional regulations invoked during aquaculture project review insure 1) compliance with local land use policy and 2) protection of natural resources, most commonly in the areas of fish and wildlife habitat and water. Again, Section 2 of this PEIR describes actions that frequently trigger the need for these local and resource agency permits. Avoiding or minimizing the issues addressed by these permits can do much to expedite the permit approval process. It is common that the following permits will be required for marine aquaculture projects:

- a Coastal Development Permit issued through the local government or California Coastal Commission,
- a US Army Corps of Engineers Form 4345 for work in navigable waters, and
- a waste discharge requirement (WDR) or NPDES permit issued by the Regional Water Quality Review Board.

Site-specific characteristics of an individual aquaculture project may invoke additional regulatory review, but it is not within the scope of this PEIR to address site-specific issues. For example, the site of a proposed individual aquaculture project may contain unique cultural resources protected by federal or state statute, or it may be located in an area of special aesthetic value that requires review of scenic impacts. Section 2 provides project preplanning recommendations that encourage project proponents to work with local planners to identify potential site-specific issues as early as possible and to subsequently act upon any permit and site development requirements associated with these issues. Similar to the approach presented for general aquaculture activities, if it is possible to avoid or mitigate potential impacts to these site-specific resources during the project planning stages, then it is possible that a project can be approved without having to develop an environmental impact report (EIR) for the individual project.

Section 5 of the PEIR provides an programmatic environmental review of potential adverse impacts that may occur with marine aquaculture projects. The review is organized using the same 16 resource categories defined in the Environmental Checklist Form presented in the 1998 amendment of the CEQA Guidelines. Within each resource category, the checklist prompts the reviewer to examine a spectrum of activities that

potentially could result in significant environmental effects if they were to occur with the project. It is important to note, however, that the checklist is not intended to represent an all-inclusive list of potentially significant environmental effects, and each resource category discussion in the PEIR may address additional activities not identified on the checklist that are common in the aquaculture industry.

A key aspect of the CEQA analysis is determining whether or not an activity may result in a significant adverse environmental effect. CEQA regulations purposefully do not define specific thresholds of significance, because the significance of an activity may vary with the setting. Instead, CEQA regulations authorize and encourage local governments to adopt thresholds that most appropriately reflect local and agency policies. A threshold of significance can be defined as a quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined. A threshold may be based on standards such as the following (GOPR 1994):

- A health-based standard such as water pollutant discharge standards, air pollutant emission standards, or noise levels.
- Service capacity standards such as traffic level of service, water supply capacity, or waste treatment plant capacity.
- Ecological tolerance standards such as physical carrying capacity, impacts on declared threatened or endangered species, or wetland encroachment.

Based on a programmatic level of analysis, marine aquaculture projects potentially may cause significant adverse environmental effects in three resource categories, as noted in the table belowthat follows. At the same time, there are numerous examples of mitigation measures implemented at existing aquaculture facilities that have a proven track record of successfully reducing these potential impacts to levels that are less than significant. These mitigation measures are described in Section 5 following each mention of a potentially significant adverse impact. For many proposed individual aquaculture projects, all issues relating to potentially significant adverse impacts will have been eliminated by avoiding sensitive habitat and by incorporating effective mitigation strategies directly into the facility design during project planning stages.

Resource Category	**Potentially Significant Adverse Impact**
Biological Resources	• Impact to sensitive species or sensitive habitat (such as eelgrass beds, wetlands or riparian habitat) displaced by project facilities • Impact on natural aquatic populations due to accidental introduction of exotic species and/or exotic pathogens • Impact on natural aquatic populations due to escapement and subsequent competition for habitat and food
Hydrology and Water Quality	• Altered flow conditions from placement of in-water structures • Water quality impact from discharge of excess feed and feces or from pond drawdown during harvest • Temporary increase in siltation sediment during harvest or facility construction
Aesthetics	• Potential impact to scenic view or perceived visual character of an area

As a Program EIR (PEIR), this summary list of potentially significant adverse impacts does not include site-specific issues (such as cultural resources) that may arise due to the unique characteristics of an individual project location. Instead, this list identifies potentially significant adverse impacts that are likely to occur based on the typical operation and facility development associated with coastal marine aquaculture projects. During the preplanning stages of an individual aquaculture project, it is feasible that a project proponent can avoid or effectively mitigate all potential impacts of the project, whether they be programmatic or site-specific in nature. The CEQA process ensures that analysis of site-specific issues will be conducted during the review of an individual project application, as well as ensuring that the mitigation measures recommended for programmatic activities are appropriate for the specific site.

Both the U.S . Department of Commerce and the state of California have implemented aquaculture policies that encourage increased development of the aquaculture industry, citing benefits to economic activity, native fish stocks, commercial and recreational fishing, and effective use of land and water resources. At the programmatic level, this common state and national objective suggests just two alternatives for the California marine aquaculture industry. The Preferred Alternative consists of approving new project applications through the current set of regulations governing the aquaculture industry, recognizing that appropriate site-specific mitigation shall be developed in the course of approving discretionary permits for the individual project. The No-Project Alternative assumes that no new aquaculture projects will be approved in California, and that the industry will continue at existing facilities and at present levels of production.

It has been demonstrated repeatedly in the U.S. that aquaculture projects can be constructed and operated with no significant adverse impacts to the environment. The aquaculture industry is subject to numerous regulatory requirements, and the environmental review process in California insures that proposed individual projects will undergo a site-specific investigation to the appropriate level of detail and with adequate public review. On this basis, the Preferred Alternative is the recommended avenue for achieving the growth objectives of both the state and federal policy and the aquaculture industry.

SECTION 2. THE APPROVAL PROCESS FOR CALIFORNIA AQUACULTURE

2.1 PURPOSE OF THIS PROGRAM ENVIRONMENTAL IMPACT REPORT

This Program Environmental Impact Report (also referred to as a Program EIR or PEIR) is intended to serve as an aid to applicants of new aquaculture projects in California. It is recognized that California's process for environmental review and permit approval is one of the most rigorous in the nation. Information in this document describes regulations governing the aquaculture industry, identifies activities that may trigger permit requirements, and gives examples of common mitigation practices. Incorporating this information into the planning and conceptual design of a proposed aquaculture facility may help a project applicant simplify the environmental review and permit approval process.

At the same time, this document is intended as a learning tool for project reviewers who may be unfamiliar with the range of activities in the aquaculture industry. There is tremendous diversity in the products sold by the industry, but at the same time there are many common elements in the methods used to produce those products. This document provides an overview of the common rearing methods and hence the common potential environmental impacts that occur in the industry.

From a technical standpoint, this Program EIR is a "first-tier CEQA document." CEQA, which is the acronym for the California Environmental Quality Act, was enacted in 1970 as a system of checks and balances for land-use development and management decisions in California. Tiering is a method that strives to streamline the environmental review by providing an initial document that analyzes broad issues of a program. As an approved CEQA document, this PEIR may be incorporated by reference into subsequent "second-tier" environmental documents prepared for individual aquaculture projects, regardless of whether the second-tier document is a Negative Declaration, Mitigated Negative Declaration, or an Environmental Impact Report (EIR). This approach allows the second-tier analysis to focus on site-specific impacts of the individual project and to provide a more in-depth analysis of specific topics, as needed. Additional discussion of the benefits and requirements of tiered documents is presented later in this section.

2.2 OVERVIEW OF THE CEQA REVIEW AND PERMIT APPROVAL PROCESS

Aquaculture development in California, like any other land use action that may potentially affect the environment, is regulated by a set of environmental review requirements defined in the California Environmental Quality Act (CEQA). The CEQA review process is rigorous by any standard. There are numerous built-in safeguards that ensure public involvement and participation as well as opportunities for localities and agencies to work cooperatively with the project applicant. A common product of the CEQA process for a specific project is a single document that summarizes the diverse environmental concerns of the permit agencies, the land use decision agency, and the general public. Depending on project components and complexity, the CEQA document may by a Negative Declaration, Mitigated Negative Declaration, or an EIR. This PEIR may serve as a first-tier document to any of these project-specific documents.

Aquaculture projects generally require several permits. The industry involves an

interaction with several natural resources that are regulated by local, State and Federal legislation. In many cases, the permit authority of these agencies provides a means of granting project approval while conditioning project operations to protect significant resources. In general, any aquaculture project that requires a discretionary permit is likely to be subject to CEQA review.

When a project requires approval from more than one permit agency, a **lead agency** must be determined. A lead agency is that permit agency that has the principal responsibility for carrying out or approving a project and preparing CEQA documents. Most often, the locality in whose jurisdiction a project is proposed will serve as the lead agency.

Once the lead agency is identified, all other involved permit agencies, whether Federal, State or local, become **responsible agencies**. Except in rare instances, responsible agencies do not prepare their own environmental review documents. The procedure by which each responsible agency issues its particular development permit is governed by the particular law which establishes the permit authority and by the California Permit Streamlining Act (PSA) (Government Code Section 659920-65963.1).

A third classification of agency involvement with the CEQA process involves the **trustee agencies**. The trustee agencies are the four California entities that have jurisdiction over certain resources held in trust for the people of California: the California Department of Fish and Game (CDFG), the State Lands Commission, the California Department of Parks and Recreation, and the University of California. In general, trustee agencies must be notified of any CEQA documents relevant to their jurisdiction, providing an opportunity for consultation and comment on the project. It is worth noting that a CEQA review of any aquaculture project will involve CDFG in its trustee function, overseeing the protection of fish and wildlife of the state, native plants designated as rare or endangered, game refuges, and ecological reserves. In addition, CDFG will be involved as a responsible agency, having a legal responsibility for carrying out and approving the aquaculture registration permit.

The permit process is independent yet integral to the CEQA process. Prior to the issuance of any permit, the responsible agency must consider potential environmental consequences of activities to be conducted under the requested permit. These concerns are summarized in the CEQA documents prepared by the lead agency. Usually a responsible agency will issue a decision on a permit application only when the CEQA review is complete.

A CEQA review may involve up to three separate, consecutive phases. Typical activities occurring in each phase are described below and summarized in Figure 2-1.

- The first phase consists of a preliminary review conducted by the lead agency to determine whether a project is subject to CEQA. In general, if a project requires a discretionary government approval (which is the case with many aquaculture permits), then it is likely that CEQA applies. If on the other hand the lead agency determines that there is no possibility for a significant environmental impact, that the proposed activity does not meet the CEQA definition of a "project", or that the project is covered by any of four categories of exemptions, then it may approve the project and complete the CEQA review process.

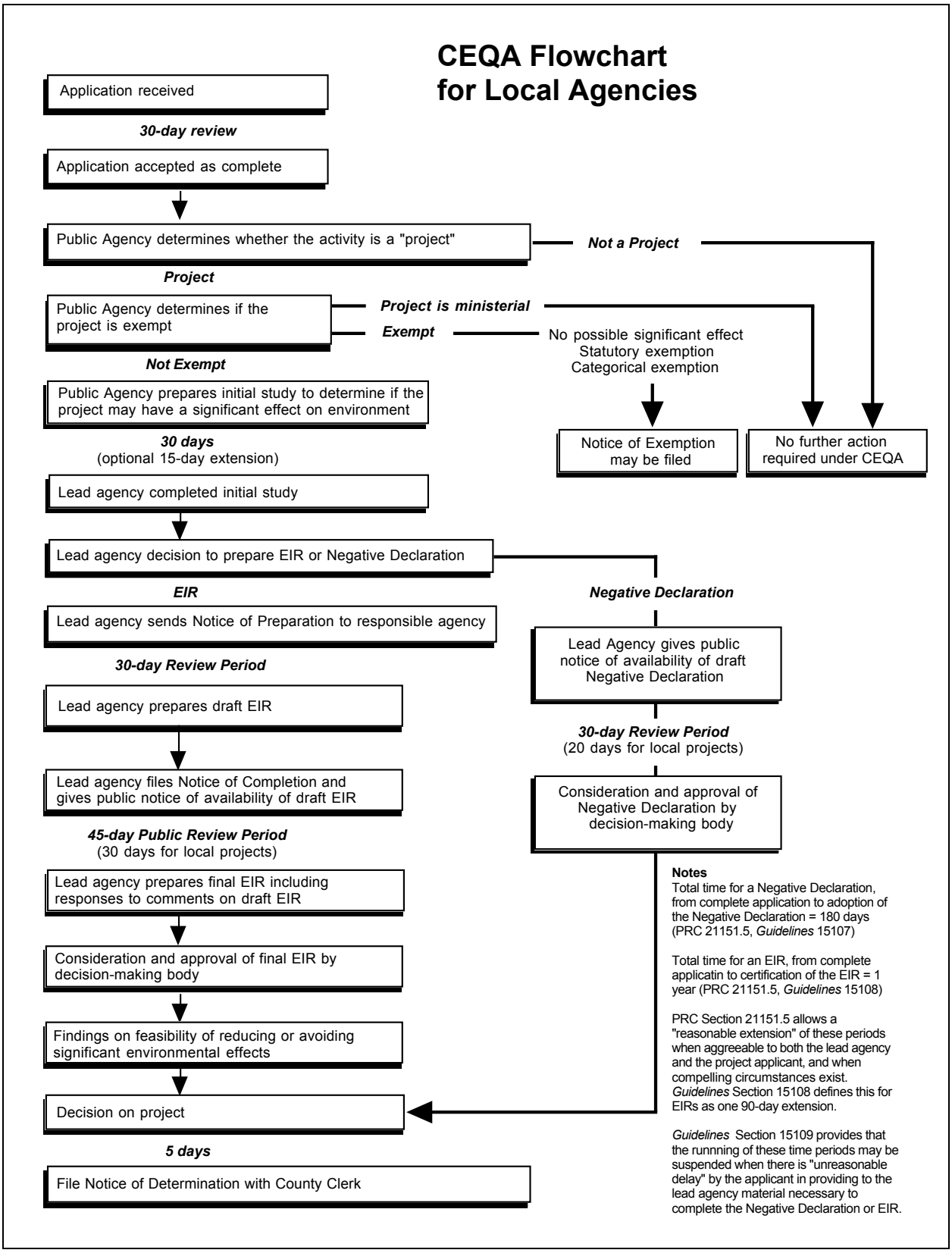

Figure 2-1. CEQA flowchart for local agencies (source: GOPR 1998).

- In cases where the project applicant is not a public entity (as with most aquaculture projects), the preliminary review will also determine whether the project is subject to the PSA. The PSA requires government agencies complying with CEQA to process these projects within State-mandated time limits. Where PSA applies, the lead agency has 30 days beyond the time an application is determined to be complete to a) assess whether CEQA applies and b) subsequently conduct an initial study as described in Phase Two below.
- The second phase of CEQA review involves preparation of an Initial Study to determine whether the project will require a Negative Declaration, a Mitigated Negative Declaration or an EIR. The Initial Study is prepared by the lead agency in consultation with the responsible agencies. In cases where the project involves a tiered analysis, the Initial Study must indicate that significant effects presented in the first-tier document were adequately addressed, or otherwise indicate specific areas requiring more detail or a site-specific analysis. A Negative Declaration can be prepared if the study concludes that the project, without mitigation, will not have a significant effect on the environment. If there are potential significant effects that will be clearly mitigated through project conditions agreed to by both the project applicant and the affected agencies, then a Mitigated Negative Declaration can be prepared. Otherwise, an EIR will be required. In this latter case, the Initial Study should also identify the specific potential significant effects on which the EIR will focus, so that the EIR can avoid unnecessary analysis of those effects that are not potentially significant or that have been adequately addressed in the first-tier document (such as this PEIR).
- The third phase of CEQA review involves preparation of the Negative Declaration, Mitigated Negative Declaration or EIR as decided in Phase Two. In all cases, a draft document is prepared by the lead agency and reviewed by the public and relevant agencies. Comments received on the draft document are taken into consideration in a final document that becomes the basis for the lead agency decision on the project.

When the CEQA review process is completed, a Notice of Determination (NOD) is issued by the lead agency. Following the NOD, responsible agencies typically must act within six months to complete permit applications previously submitted for the project.

This Program EIR may be useful to the lead agency during all three phases of CEQA review. This document identifies common practices of aquaculture that have potential to cause significant environmental effects, and it also describes standard mitigation measures and regulatory requirements that typically reduce the effect to a less than significant condition. Project applicants for individual aquaculture projects should be encouraged to consult with the lead agency to identify site-specific concerns relating to land development, for example, to identify whether wetlands, cultural resources, or endangered species may be present at the proposed site. If there are no site-specific concerns, or if the project description clearly identifies mitigation measures that will be implemented to avoid or minimize environmental effects, then it should be appropriate to complete the CEQA review process with a Negative Declaration or Mitigated Negative Declaration. If there are significant environment effects expected following implementation of all feasible mitigation measures, then it will be necessary to prepare an EIR. These project-specific CEQA documents can most likely be streamlined by stating they are tiered to this PEIR and noting where this document is available for review.

During the preliminary review of an individual aquaculture project, a Lead Agency may conclude there are potential significant effects from the project that were not considered or not adequately addressed in this PEIR. In such cases, the Lead Agency must conduct an Initial Study that analyzes the additional effects, leading subsequently to either a Negative Declaration, Mitigated Declaration, or EIR for the individual project. It is assumed that this PEIR will still benefit the environmental review process and will be incorporated by reference into the Initial Study and the subsequent environmental document.

2.3 COMMON PERMIT REQUIREMENTS FOR AQUACULTURE

As an aid to determine the State and local permits required for a project, the California Office of Permit Assistance suggests the following questions be asked (COPA 1997):

- Where is the project **located**?
- What specific **activities** does the project involve?
- What **resources** are affected by the project?

Generally, the **location** and geographic area of a project will determine the lead agency responsible for CEQA review and may indicate the need for additional land development permit requirements. Early contact with these agencies may be the most influential factor in expediting the permit process. With respect to **activities**, every proposed commercial aquaculture project in California will be required to obtain an Aquaculture Registration permit from the California Department of Fish and Game (CDFG). Depending on the species to be cultured and the proposed specifics of the project, CDFG may identify additional aquaculture permits required for operation. Finally, the **resources** most likely to be affected by aquaculture projects involve fish and wildlife habitat and water. The protection of fish and wildlife habitat is assured by CDFG during the same review process that provides approval of the Aquaculture Registration permit, and through Department regulation of approved facilities. Water resources may be affected in two ways, either by the use of surface or groundwater sources as a facility water supply or by the discharge of facility wastes into surface water. The agencies providing review for the protection of water resources are likely to be the Regional Water Quality Control Board and/or CDFG, depending on the proposed project.

Table 2-1 provides a listing of permits that are commonly required for marine aquaculture projects, grouped by the three categories noted in the questions above. Not all of these permits will be required of a project, and in many cases a specific operating plan and detailed facility design will be required before a determination can be made on permit requirements. The subsections following the table provide a summary of key concerns of each permitting agency. In many cases there is discussion on operating conditions or threshold conditions that triggers the need for a permit; conversely, the avoidance of these activities can eliminate the need for a permit. A more detailed discussion of many of these regulatory requirements can be found in A Guide to California State Permits, Licenses, Laws and Regulations affecting California's Aquaculture Industry (ICAD 1994).

Table 2-1. Example permit screening for California marine aquaculture projects.

Permit	Agency	Required for:
LOCATION AND GEOGRAPHIC AREA		
Land Use Permit and/or CEQA Review	City or County Government	Compliance with local regulations and State environmental review requirements
Coastal Development Permit	California Coastal Commission	Proposed development from 3 miles offshore to 1,000 yards inland
Application for Lease of State Water Bottoms	Department of Fish and Game	Use of State owned tidelands (Sovereign Land) for aquaculture purposes
Private Aids to Navigation Permit	U.S. Coast Guard	Obstruction or aid to navigation in the waters of the U.S.
Development Permit	San Francisco Bay Conservation and Development Commission	San Francisco, San Pablo, and Suisun Bays from highwater to 100 feet inland
AQUACULTURE ACTIVITIES		
Aquaculture Registration	Department of Fish and Game	The culture and husbandry of aquatic organisms, including, but not limited to, finfish, shellfish, and algae.
Standard Live Fish Importation Permit	Department of Fish and Game	Importation from out of State of most live aquatic species
Long-term Live Fish Importation Permit	Department of Fish and Game	Importation of aquatic species; on an ongoing basis that do not represent a significant concern for potential impacts on State wildlife resources.
Health Certificate by Appropriate Out of State Agency	Department of Fish and Game	Importation of salmonids and other aquatic species.
Private Stocking Permit	Department of Fish and Game	Generally required for aquaculture products stocked in the State, except for sales between aquaculturists registered with the Department for the species in question
Wild Broodstock Collection Permit	Department of Fish and Game	Permission to collect wild stock for use in developing a domestic broodstock
Permit for Exotic or Restricted Species	Department of Fish and Game	Species not established in California or listed as detrimental
Addition of Species to Individual Certificates of Registration	Department of Fish and Game	Adding species to the current registration list
Aquarium Dealers Permit	Department of Fish and Game	Aquarium dealers wishing to sell sturgeon or abalone; must be obtained from registered aquaculturists and sold as pets
Certification of Growing Water	Dept. of Health Services (Environ. Mgmt. Branch)	All shellfish harvested commercially for human consumption
Shellfish Handling and Marketing Certificate	Dept of Health Services (Food and Drug Branch)	Shellfish dealers
Weighmaster Registration	Dept of Food and Agriculture	Those selling aquaculture products by weight

(continued next page)

Table 2-1. (Cont.)

Permit	Agency	Required for:
RESOURCES		
Notification of Streambed Alteration	Department of Fish and Game	Change (divert/obstruct) the bed, channel or bank of any river, stream or lake
Department of the Army Permit (Form 4345)	U.S. Army Corps of Engineers District Office	Anyone proposing to locate a structure, excavate, or discharge dredged materials into the waters of the U.S.
Report of Discharge	Regional Water Quality Control Board	Any aquaculturist discharging, or proposing to, waste that may affect water quality
National Pollution Discharge Elimination System (NPDES) Permit	Regional Water Quality Control Board	Any facility discharging waste into any surface waters of the State

2.3.1 Location and Geographic Area

The entity most likely to be responsible for the CEQA review of an aquaculture project is the local City or County that governs the project location. There are currently 58 counties and approximately 468 incorporated cities in California. The local government should be consulted early in the planning process to determine which local zoning ordinances may pertain to the project. The local government is likely to be the lead agency in the CEQA review process.

If the proposed project lies within the coastal zone, which is generally defined as from 3 miles offshore to 1,000 yards inland from the mean high tide, it is necessary to obtain a **Coastal Development Permit** through the California Coastal Commission. This definition of coastal zone can vary in urban areas or where watersheds, estuaries, wildlife or recreational areas are located. The local government will be able to identify the specific coastal zone boundary and will indicate whether a local agency acts in behalf of the Coastal Commission to issue the Coastal Development Permit.

Project applicants seeking to utilize State owned and managed tidelands must apply to lease tidelands with the Fish and Game Commission. The process uses the **Application for Lease of State Water Bottoms for Aquaculture** (Form A). Assistance in acquiring and completing the application can be obtained from any of the offices of the Marine Region of the Department of Fish and Game. Offices are located in MonterayMonterey, Los Alamitos and Belmont.

If the proposed aquaculture facility is located in navigable waters of the U.S. and involves any structures that might be an aid or obstruction to navigation, the project proponent must submit a permit application to the U.S. Coast Guard using the form titled **Private Aids to Navigation Application (CG-2554)**. Review of this form by the U.S. Coast Guard will determine what requirements might be placed on the proposed structures. The form can be obtained from the Coast Guard office in Long Beach.

Certain geographic areas of California have additional permit requirements that serve to protect special features of the area. Examples include permits issued to projects located in San Francisco Bay, San Pablo Bay and Suisun Bay. Consultation with the county government should identify whether any special geographic permits exist for a specified project location.

2.3.2 Aquaculture Activities

Aquaculture in the state of California has been classified through legislation to be an agricultural activity, and it is therefore regulated under the same statutes and benefits offered to the agriculture industry as a whole. At the same time, the nature of aquaculture results in its crossing into the regulatory purview of many other agencies. Foremost, every commercial aquaculture project in California must register with CDFG, which makes a determination on the acceptability of the species to be reared and the facility design. Governing codes and regulations include Fish and Game Code 15102, which states aquaculture operations may be prohibited "where it is determined it would be detrimental to adjacent native wildlife"; and the chapter in the California Code of Regulations pertaining to aquaculture (CCR Title 14, Division 1, Chapter 9 [Sections 235-245]). In addition, specific production activities may dictate the need for other permits from a State or local entity. The precise need and governing regulations for these permits will be dictated by the location of the project as well as the specific design and operational features.

2.3.2.1 Aquaculture Registration

To conduct an aquaculture business, which entails the commercial rearing of live aquatic plants or animals for food, bait or stocking into public waters, or for other commercial sale, *each* operator must complete and submit an **Aquaculture Registration Application** (Form FG 750) to CDFG. The application form can be obtained from the following location:

CDFG License and Revenue Branch
3211 South Street
Sacramento, California 95816
Telephone (916) 227-2271

2.3.2.2 Obtaining or Moving Aquatic Species

The CDFG regulates the importation, transportation, stocking, and possession of aquatic species to prevent the introduction of undesirable species to bodies of water where they do not already exist, and to prevent the dissemination of fish diseases and parasites to wild populations and cultured stocks. Registered aquaculturists are allowed to transport live product within the State under conditions provided for in regulation specified in the California Code of Regulations (CCR), Title 14, and Chapter 9 (beginning with Section 235).

Certain species are designated as Detrimental by the Commission through their listing in Section 671, Title 14, CCR. These are species that the Commission has determined to be undesirable, or a menace to native wildlife, the agricultural interests of the State (including aquaculture), or to public health or safety. A special permit is required for possession of any of these species for any purpose, including aquaculture. Normally, these species are not approved for aquaculture purposes.

Regulations require a permit to import live aquatic plants and animals for aquaculture. All imported aquatic plants and animals are subject to inspection to make certain unwanted species, diseases, and parasites are excluded. Live aquatic plants and animals may be imported into California under the terms of two different types of permits issued by CDFG. They are Form FG 786 (Long-term Importation Permit) and Form FG 789 (Standard Importation Permit). The Standard Importation Permit is the type of

permit required for the importation of most aquatic species. This permit is for a single shipment, and the shipment is often inspected.

Under certain conditions, live aquatic animals may be imported under the provisions of a Long-term Importation Permit. This type of permit is intended for repeated importations under the same conditions (same species from the same origin to the same destination). To qualify for this type of permit, the risk of introducing diseases, parasites, or undesirable species with the imported animals must be very low. Examples are animals which:

1) are taken from drainages absent diseases, parasites, or exotic species of concern,
2) normally will not be maintained alive in the waters of the State, or
3) the CDFG has reason to believe harbor no known new fish diseases or parasites of concern, which might be introduced to waters of the State.

An examples is the importation of oyster seed from approved facilities for which there is a long history of disease-free status.

Long-term Importation Permits are issued at the discretion of the CDFG for periods of up to one year from the date of issue. Inspections of live aquatic animals imported under the provisions of a Long-term Permit may be conducted at the discretion of the Department.

Applications for both types of importation permits and information on these permits may be obtained from the following location:

CDFG Fisheries Programs BranchMarine Region
1416 Ninth Street20 Lower Ragsdale Road, Suite 100
SacramentoMonterey, California 9581493940
Telephone (916) 653-8262(831) 649-2893

At times, stocks of plants or animals may be unavailable from commercial sources in California and CDFG has the authority to allow collection, from the wild, of plants or animals to be used in developing the cultured domestic stock. A registered aquaculturist may apply for collection of wild species using Application for Wild Broodstock Collection Permit (Form FG 794), obtainable from the Marine Region office noted above.

Private stocking (release) of aquaculture product into State waters is regulated by Section 238.5 of Title 14, CCR, which may require a Private Stocking Permit (Form FG 749). The permit application can be obtained from the Marine Region Monterey office. This permit, when approved, allows stocking of an aquaculture product by a private party into State waters.

Authorization to sell two specific aquaculture products, white sturgeon and abalone, in the aquarium trade requires a special permit. The aquarium dealer must apply to CDFG using Aquarium Dealer's Application and Permit to Sell White Sturgeon and Abalone Raised as Aquaculture Products (Form FG 972), obtainable from the Marine Region Monterey office. A number of conditions are included in the permit to assure that the animals are from an appropriate source and are sold as pets and not to be stocked into waters of the State.

2.3.2.3 Shellfish Aquaculture

The cultivation of bivalve molluskan shellfish (mussel, oysters, clams, scallops) for human consumption is regulated by the Department of Health Services (DHS). This

agency is responsible for ensuring that these shellfish are grown in waters meeting a standard of cleanliness and for approving handling, packaging and quality standards of the product. These regulatory needs are necessary to certify that a healthful product is supplied to the public.

Water quality in shellfish growing areas is approved through the Environmental Management Branch of DHS. The aquaculturist must submit an **Application for Shellfish Growing Area Certificate** (Form SSP 11). The Food and Drug Branch of DHS administers the facility, handling, packaging and quality standards. This process is initiated with the submission of the **Shellfish Handling and Marketing Certificate**.

The DHS also monitors shellfish grown along the California coast for marine biotoxins. Commercial shellfish harvesters are required to submit weekly samples of shellfish for testing to the DHS laboratory.

2.3.2.4 Business Requirements

Because aquaculture is designated as an agricultural industry it must comply with certain sections of the Food and Agriculture Code. The Department of Food and Agriculture regulates aquaculture with the **Weighmaster Registration**. An aquaculturist selling product by weight must complete the weighmaster registration.

2.3.3 Resources

2.3.3.1 Fish and Wildlife Habitat

Permits are likely to be required if the project involves activities that would locate a structure, excavate or discharge dredged materials into waters of the U.S. or to transport dredged materials for the purpose of dumping it into ocean waters, then the U.S. Army Corps of Engineers (COE) permit **Application for Department of the Army Permit** (Form 4345) is required. For projects within the San Francisco Bay Area counties these activities may be permitted using the **Joint Aquatic Resources Permit Application (JARPA)**. This consolidated permit is filed with CDFG and the COE to meet their individual regulatory concerns.

2.3.3.2 Water Resources – Wastewater Discharge

Maintenance of water quality and the protection of water resources in the State are the legislated responsibility of the State Water Resources Control Board. The State of California also has primacy for water quality and implements a large portion of the Federal Clean Water Act. There are nine Regional Boards, which regulate waste discharge through the **Waste Discharge Requirements (WDR)** permit. In addition they also administer the **National Pollution Discharge Elimination System (NPDES)** permit.

Any aquaculture activity that may discharge waste that could affect water quality must file **Form 200 Report of Discharge** to the appropriate Regional Water Quality Control Board office. If the discharge is to surface waters of the State, U.S. Environmental Protection Agency (USEPA) **Form 3510-2B** must also be filed with the regional office. The Regional Board will then review the forms and issue the appropriate permits (WDR and/or NPDES) depending on the size and other components of the operation. If the project involves activities that would discharge dredged materials into waters of the U.S., then the U.S. Army Corps of Engineers (COE) permit **Application for Department of the Army Permit** (Form 4345) is required. For projects within the San Francisco Bay

Area counties these activities may be permitted using the **Joint Aquatic Resources Permit Application (JARPA)**. This consolidated permit is filed with CDFG and the COE to meet their individual regulatory concerns.

2.4 Strategies for Aquaculture Permit Approval

2.4.1 Project Planning

The process of developing a plan for an aquaculture facility involves a balance of competing factors. In order to remain in business, an aquaculture facility must be able to operate profitably, utilizing natural and human resources in a cost-effective manner. At the same time, the project must comply with regulations that protect environmental resources. Proactive measures to reduce environmental impacts through the proposed design and operation of a facility may simplify and expedite the CEQA review and permit approval process.

Issues relating to aquaculture projects can usually be placed into two categories: those that involve the specific species and rearing methods proposed for culture, and those that relate to site characteristics. Very early in the planning stages, project proponents should discuss project concepts with **both** the **Department of Fish and Game** and the **local City or County government**. (When a site is located within the boundaries of a Local Coastal Plan, the local government will also call on the regulatory authority of the California Coastal Commission.) Discussions with these entities should focus on items that can trigger the need for additional permits or special facilities, as described in the following paragraphs.

Preparing a draft version of the Aquaculture Registration Application may be a useful way to approach an initial consultation with the Department of Fish and Game. The form requires the applicant to identify the species to be maintained at the facility, the source of the water supply, and the proposed method of preventing organisms from entering or escaping at the facility inlet and outlet locations. Applicants need to be aware that certain species are prohibited from importation and culture, and other species require special approval. Information regarding special species requirements can be found in free Informational Leaflets that can be obtained from the office of the Aquaculture Coordinator in the Department of Fish and Game:

CDFG Aquaculture Coordinator
1416 Ninth Street
Sacramento, California 95814
Telephone (916) 455-4034

Applicants are also encouraged to review information in the aquaculture permit guide (ICAD 1994) that can be obtained for $10 from the same office, which contains many of the permit application forms noted in Table 2-1. During the initial consultation, the Department can give some indication of the level of baseline information, special facility design features, and post-operational monitoring that may be required depending on the proposed culture species. The applicant should incorporate these recommendations into the facility development plan as soon as possible and evaluate their potential cost implications, or consider switching to an alternate culture species that has simpler and more standard rearing requirements.

Early in the planning stages, the applicant should also strive to collect as much informa-

tion as practical regarding site-specific characteristics of the project location. Specific items of concern include the presence of wetlands, riparian habitat, critical habitat for sensitive species, floodplains, coastal access, aesthetic resources, and cultural resources. In many cases, the local government may have existing surveys that indicate the potential risk of finding these resources on a particular site. Early consultation with the local planning agency can help identify high-risk resources which suggest the need for more data. The ability to confirm the presence or absence of special resources on a site can influence facility design. Efforts made during the preliminary design stages to avoid or minimize impact on special resources through structural siting or operational planning will often result in an overall decrease in cost by reducing the need for facility redesign.

2.4.2 Twelve Helpful Tips

The following common sense tips are offered by the Office of Permit Assistance (COPA 1997) to make the CEQA review process easier. As suggested in the previous subsection and in the first tip below, an early consultation with the Department of Fish and Game, the local government and other key agencies (such as the CCC) can help an applicant clearly understand the process, make sure that assumptions have been addressed, and identify timelines. Once this early consultation has helped resolve conceptual ideas to avoid problem areas, the other 11 tips can help to make the process move more smoothly.

1.	CONSULT EARLY	Consultation with permitting and regulatory agencies should begin as early as possible in planning your project. At this point potential concerns can be addressed with the appropriate individuals.
2.	USE THE SERVICES OF THE CALIFORNIA OFFICE OF PERMIT ASSISTANCE	The staff of the California Office of Permit Assistance will help identify the regulatory agencies, set up meetings with them, and will help facilitate expeditious permit reviews.
3.	WRITE A COMPLETE PROJECT DESCRIPTION	A complete project description is crucial. See the next subsection for how to write a complete and accurate project description.
4.	LEARN THE RULES	Take time to study the protocols and regulations of those agencies that must approve your project. Study all applicable State, local and Federal agency permitting requirements.
5.	KNOW THE REGULATORS	Become familiar with the regulators and how they function. Attend meetings. Read previous staff reports, permit conditions, and studies relating to your project.
6.	REDUCE ADVERSE ENVIRONMENTAL IMPACTS	Design your project to eliminate or reduce as many potential health concerns and environmental impacts as possible. Consider environmentally superior alternatives. Incorporate the suggestions you learned during early consultation. Retain a competent consultant.
7.	INVOLVE THE PUBLIC	Plan a public participation program. Meet with them, get their ideas and views. Use press releases and announcements to keep them informed about the progress of your project. Avoid surprises.
8.	DO NOT APPROACH THE PROCESS WITH AN ADVERSARIAL ATTITUDE	It is generally counterproductive to resist the permit process as you are going through it. An adversarialy attitude often results in hostility and could delay your project.

9. PAY ATTENTION TO DETAILS	Follow all the rules. Respond promptly to requests for information. Be on time for meetings with representatives of the regulating agencies. Do not cut corners. Get in writing all dates, procedures, fees, etc.
10. BE WILLING TO NEGOTIATE	Recognize that government regulators have a great deal of authority over your project. But they are willing to negotiate and you should be, too.
11. SELECTING YOUR SITE	Exercise your usual due diligence. Do not secure rights to a site without studying the environmental constraints and surrounding land uses. Evaluate alternative sites.
12. WHEN IN DOUBT, ASK	If you are not sure whether your project needs a permit or whether it is regulated at all, ask. Get written confirmation. Going ahead without following the proper guidelines will ultimately cost you more time, money and goodwill.

2.4.3 The Components of a Good Project Description

Presenting the lead agency with a concise and comprehensive project description is crucial to the smooth processing of a development application. Conversely, a vague description that does not accurately represent the proposal or a description, which is in a state of flux, makes processing unnecessarily time-consuming. Extra time spent at the beginning of a project writing a good project description can save processing time down the line. As the project progresses and agency recommendations are developed to reduce or mitigate impacts, it will facilitate the permit process to incorporate discussion of these issues and responses in the project description of any subsequent permit applications.

The Office of Permit Assistance (OPA 1997) suggests that a good project description should contain the following elements:

(a) The precise location, boundaries, and physical characteristics of the proposal illustrated on a local map and a plot plan. The type of map may vary depending on the project scope and the terrain.

(b) A general description of the project's physical, operational, and environmental characteristics. These may include, but are not limited to, the following, as applicable:

- the size of the project site;
- existing and proposed land uses;
- existing general plan and zoning designations, and any proposed changes;
- the species being cultured and the proposed rearing methods;
- the size of proposed structures;
- the roads which will provide access and any proposed improvements;
- expected levels of traffic on those roads;
- impact on public works such as water and sewer, and any proposed improvements related to the project;

- impacts on applicable air quality, water quality, drainage, and noise standards and proposed actions to meet those standards;
- any natural systems which would be disrupted (riparian habitat, wetlands, animal and plant life, etc.); and
- any historic structures or archaeological sites which would be disturbed;
- quantity of air emission and/or discharge based on equipment to be used;

(c) A list of the specific permits or other approvals being applied for and the various agencies involved.

The project description should be sufficiently detailed to allow permitting agencies to determine how their regulations and requirements would apply. Contacting permitting agencies informally before filing an application to discuss the project and applicable regulations and requirements can help inform you of the items that should be included in the project description.

2.5 BENEFITS AND REQUIREMENTS OF THE PROGRAM EIR

The following section contains information regarding the statutory requirements for preparation of a Program EIR. This information may be of greater relevance to agencies involved with environmental review of aquaculture projects, though project applicants may also find it useful in understanding the CEQA process.

2.5.1 Benefits of Program EIRs

CDFG has prepared this PEIR to assist in the regulation and approval of future individual aquaculture projects. PEIRs are typically prepared for regulatory programs to evaluate the broad environmental effects of the implementation of the regulatory process with the acknowledgment that site-specific environmental review may be required for specific projects. By definition, actions that provide for a PEIR include:

- Activities that are linked geographically
- Activities that are logical parts of a chain of contemplated events
- Rules, regulations, or plans that govern the conduct of a continuing program
- Individual activities carried out under the same authorization statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways.

Through the preparation of a PEIR, the following objectives are met:

- Consideration of impacts and alternatives that would not be practical in an individual EIR
- Focus on cumulative impacts that might be slighted in a case-by-case analysis
- Avoidance of continual reconsideration of recurring policy issues
- Consideration of broad policy alternatives and programmatic mitigation measures at an early stage when the agency has greater flexibility to deal with them
- Expedite the permitting process within State regulatory agencies by providing standard mitigation measures.

Within this PEIR, broad program-wide impacts, management strategies, and program-wide mitigation measures have been evaluated. The site-specific effects caused by aquaculture facilities are to be reviewed and considered within subsequent permit

applications on a project-by-project basis. These subsequent project-specific environmental documents may incorporate the PEIR by reference, pursuant to 40 CFR 1502.24 and Section 15150 of the CEQA Guidelines.

To determine impacts, it was necessary to anticipate the types of aquaculture projects likely to be proposed in the future. Based on our current understanding of the industry, the project description (Section 3) describes the various marine aquaculture alternatives likely to be proposed in the future. An impact assessment was then conducted for these aquaculture alternatives. Broad environmental issues identified in this PEIR include:

- Adverse and beneficial impacts on existing aquatic species and sensitive habitat
- Adverse and beneficial impacts on birds and mammals
- Adverse and beneficial impacts on water quality

As the aquaculture industry continues to evolve, future projects will need to be reviewed for their similarities and differences to those addressed in the PEIR. Project activities not defined in this document will require additional environmental analysis in project-specific CEQA elements.

2.5.2 CEQA Requirements of the Program EIR

This PEIR has specifically been prepared by CDFG to analyze and disclose the potential environmental effects of California marine aquaculture projects. Accordingly, this PEIR reviews generic marine aquaculture projects and establishes a tiering framework for subsequent project-specific environmental reviews. It also seeks to achieve a number of important objectives established by CEQA. The key principles that guided the preparation of the analyses contained in this PEIR are described briefly in the following.

Legal Compliance. This PEIR complies with the California Environmental Quality Act (CEQA), in order to achieve legal compliance.

Reasonably Feasible Analyses. CEQA Guidelines, Section 15151 states the standard for adequacy of an EIR is:

> *An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.*

Significant Effects, Mitigation, and Alternatives. As noted in the California Public Resources Code (Section 21002.1) and the CEQA Guidelines (Sections 15002(a) and 15003), the focus of the analysis in an EIR or PEIR should be on three key elements:

1) the significant effects of the proposed action or project;
2) mitigation measures that will minimize significant effects; and
3) consideration of a reasonable range of alternatives that reduce the significant effects.

In addition, CEQA sets forth certain mandatory findings of significance (CA Pub. Res. Code Section 21083 and CEQA Guidelines Section 15065). According to CEQA, a project will have a significant effect if it will:

- Substantially degrade environmental quality;

- Substantially reduce fish or wildlife habitat;
- Cause a fish or wildlife habitat to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community;
- Reduce the numbers or range of a rare, threatened, or endangered species;
- Eliminate important examples of the major periods of California history or prehistory;
- Achieve short-term goals to the disadvantage of long-term goals;
- Have possible environmental effects that are individually limited but cumulatively considerable when viewed in connection with past, current, and reasonably anticipated future projects.
- Have environmental effects that will directly or indirectly cause substantially adverse effects on human beings.

To be considered adequate, mitigation measures should be specific, feasible actions that will actually improve adverse environmental conditions. Mitigation measures should be measurable to allow monitoring of their implementation.

The range of alternatives required in an EIR is governed by a "rule of reason" that requires an EIR to set forth only those alternatives necessary to permit a reasoned choice. An EIR need not consider every conceivable alternative to a project. Alternatives must be limited to ones that meet the project objectives, are ostensibly feasible, and would avoid or substantially lessen at least one of the significant environmental effects of the project.

Understandable to the Public. The PEIR should be accessible and understandable to the informed lay public. A major intent of CEQA is to provide adequate public participation throughout the entire process in a good faith effort to solicit public input for the EIR. Documents must adequately address reasonable concerns raised by the public during the process (CA Pub. Res. Code Sections 21092 - 21092.5 and CEQA Guidelines, Section 15200 - 15204).

Objective Criteria and Substantial Evidence. The analysis and determination of significant effects related to a project should:

1) be based upon objective criteria used to define "thresholds of significance." For example, thresholds of significance may be based on criteria defined in adopted standards, regulations, policies or plans. **A change in the environment is not a significant effect if it complies with a standard that meets all of the following criteria:**
   - The standard contains a quantitative, qualitative, or performance requirement found in a statute, ordinance, resolution, rule, regulation, order, or other standard of general application.
   - The standard was adopted for the purpose of environmental protection.
   - The standard was adopted by a public agency through a public review process to implement, interpret, or make specific the law (enforced or administered by that agency).
   - The standard applies within the jurisdiction where the project is located.

   Noncompliance with these performance levels would normally be determined to be a significant impact and compliance would normally be determined to be considered less than significant;
2) take in to account certain types of impacts that invoke mandatory findings of

significance as outlined in CEQA;

3) be based upon substantial evidence, such as factual or scientific data to support conclusions regarding the significance of effects. This evidence must be in the record, either in the EIR or adequately referenced and available to the public; and,
4) include direct and indirect impacts, short-term and long-term impacts, cumulative and growth-inducing impacts. This includes examining the context of the impacts (e.g. local and statewide) and the intensity of the impacts (CEQA Guidelines, Sections 15064, 15065, 15126(a, b, e, f & g), 15130, 15382, Appendices K and G).

Mitigation Tied to Specific Impacts. Identified mitigation measures are tied to specific significant adverse impacts. Mitigation measures are proposed to minimize significant effects. Mitigation can potentially avoid, minimize, rectify, reduce or eliminate, or compensate for impacts. Good mitigation measures will explain: 1) the objective of the measure; 2) a specific action to be implemented that will result in real and measurable change to the impact; 3) who will be responsible for implementing and monitoring the action; and 4) a schedule for implementation (CEQA Guidelines, Sections 15126(c) and 15370).

Decision-making Orientation. Each EIR and PEIR provides the basis for findings and decisions made by the Lead Agency and Responsible Agencies. Once a final EIR or PEIR is completed, the agencies must provide a written record regarding the conclusions of the document and the choices made about the proposed project or action. When approving a project in compliance with CEQA, agencies must make specific findings regarding each significant impact identified in the project EIR. These findings must state that either: 1) mitigation measures adopted will reduce the impact to a less-than-significant level; or 2) that it is not feasible to mitigate the significant impact, but that there are other overriding considerations for approving the project anyway (CEQA Guidelines, Sections 15091 & 15092).

Program Review and Tiering. This PEIR considers broad measures, subsequent CEQA review requirements, and programwide mitigation measures. The site-specific effects of marine aquaculture program approval are to be reviewed and considered within subsequent environmental documents on a project-by-project basis. These subsequent project-specific environmental documents may incorporate this PEIR by reference, pursuant to Section 15150 of the CEQA Guidelines. CEQA encourages the use of policy-level documents and tiering, as outlined in the following.

Section 15168(a) of the CEQA Guidelines states:

> *A program EIR is an EIR which may be prepared on a series of actions that can be characterized as one large project and are related either: (1) Geographically; (2) As logical parts in the chain of contemplated actions; (3) In connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or (4) As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways.*

CEQA, in Public Resources Code Section 21068.5, defines tiering as:

> *...the coverage of general matters and environmental effects in an environmental impact report prepared for a policy, plan, program or ordinance followed by narrower or site-specific environmental impact reports which incorporate by reference the discussion in any prior environmental impact report and which concentrate on the environmental effects which (a)*

are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior environmental impact report.

Good Faith Disclosure. This PEIR makes a good faith attempt to fully disclose the effects of the proposed action. The function of CEQA documents is to provide full disclosure to the public and decision-makers on the issues and facts regarding the environmental aspects of a proposed project or action. The environmental documents do not make decisions for governmental agencies, but rather they provide useful information that allows for public discussion and debate, and for decision-makers to ultimately make a choice (CA Pub. Res. Code, Section 21002.1 and CEQA Guidelines, Sections 15002(a) and 15003).

Short-Term Uses Versus Long-Term Productivity. Section 15126(e) of the CEQA Guidelines explains that the PEIR should address *"The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity"*, and that *"Special attention should be given to impacts which narrow the range of beneficial uses of the environment or pose long-term risks to health or safety."* The following considers the continued development of aquaculture facilities in light of these requirements.

Commercial aquaculture in California provides nearly 37 million pounds of product annually. Industry's objective is to create economic opportunities in aquaculture while protecting natural biological resources, water quality, human health, and the environment. By doing so, commercial aquaculture can continue in an environmentally sound and sustainable fashion. Compliance with mitigation measures set out in this PEIR will enable a significant beneficial use of water resources without undue short-term or long-term impact to other resource categories. Commercial aquaculture complements efforts to restore and maintain sustainable wild stock fisheries in order to maximize the benefits of aquatic and ocean resources for U.S. citizens.

Irreversible or Irretrievable Commitments. Section 15126(f) of the CEQA Guidelines explains that the PEIR should address *"Any significant irreversible environmental changes which would be involved in the proposed action should it be implemented."* The following considers the aquaculture industry in light of this requirement.

With proper mitigation and site-specific environmental review, aquaculture facilities can continue to be constructed and operated within California without irreversible environmental change. By relying more on commercial aquaculture products, and less on the consumption of wild species, aquaculture can also help facilitate the recovery of native species currently in danger of extinction, such as salmon species.

SECTION 3. PROGRAM DESCRIPTION

3.1 STATE AND FEDERAL VISIONS OF THE AQUACULTURE INDUSTRY

The state of California recognized the potential of aquaculture in 1979 with passage of SB 52, commonly referred to as the California Aquaculture Development Act. The Act declares that the practice of aquaculture should be encouraged in order to augment food supplies, expand employment, promote economic activity, increase native fish stocks, enhance commercial and recreational fishing, and protect and better use the land and water resources of the state. The Act also establishes a policy and program aimed at improving the science and practice of aquaculture as a means of expanding aquaculture industry and related economic activity in the state. The California Aquaculture Development Act can be found in Division 1, Chapter 4 of the California Public Resources Code.

The National Aquaculture Development Act of 1980, amended in 1985, set the stage for coordinating the efforts of the U.S. Departments of Agriculture (USDA), Commerce (DOC) and Interior (DOI) in a plan to develop the aquaculture industry in the United States. The aquaculture policy subsequently developed by DOC has a stated mission to create sustainable economic opportunities in aquaculture in a manner that is environmentally sound and consistent with applicable laws. The mission statement notes the following benefits that can accrue from this policy:

- The mission complements and is an integral part of DOC efforts to restore and maintain sustainable wild stock fisheries in order to maximize the benefits of coastal resources for U.S. citizens.
- Aquaculture can make major contributions to the local, regional, and national economies by providing employment and by creating business opportunities.
- The United States can lead the world in the development of aquaculture technologies and advance international guidelines for the industry in order to maintain a healthy environment.

Specific objectives of the DOC aquaculture policy by the year 2025 include:

- Increase the value of domestic aquaculture production from the present $900 million annually to $5 billion, which will help offset the $6 billion annual U.S. trade deficit in seafood.
- Increase the number of jobs in aquaculture from the present estimate of 180,000 to 600,000.
- Double the value of non-food products and services produced by aquaculture in order to increase industry diversification.
- Enhance depleted wild fish stocks through aquaculture, thereby increasing value of both commercial and recreational landings and improving the health of our aquatic resources.

3.2 OVERVIEW OF THE CALIFORNIA AQUACULTURE INDUSTRY

The origins of the aquaculture industry in California can be traced back to the 1850s, when the sudden influx of human population resulted in an intense fishing pressure and rapid decline in natural stocks of the Native oyster (Conte et al. 1996). To meet the market demand, Native oysters were collected from other West Coast bays and transported into San Francisco Bay, where they were maintained in oyster beds and subsequently marketed throughout central California. Until the early 1900s, San Francisco Bay was the site of the largest oyster industry on the West Coast. The expansion of the population, with resultant water quality degradation, reduced the capability of the Bay to produce high quality oyster meat.

Today the aquaculture industry is among the fastest growing segments of United States agriculture. In 1974 the value of products sold by the US aquaculture industry was $45 million, but by 1998 this value increased to more than $978 million (USDA 1998). In the first national census ever conducted for the aquaculture industry, the value of California's aquaculture industry was reported at $45 million, making it the eighth greatest aquaculture producer in the nation (USDA 1998). However, two regional aquaculture surveys suggest the California production value is higher, in the vicinity of $71 million to $83 million, based on a total live weight production of 31 to 36 million pounds (WRAC 1999; CAA 1999). Production summary statistics from all three sources are presented in Table 3-1. It has been suggested that the low values of the national census are probably an undercount attributable to the first-time action of the survey.

California has the most diverse aquaculture industry in the United States (Conte 1990). The state's size, combined with its particular geology and topography, provide a multitude of climatic and water conditions suitable for a variety of growing conditions. In recent years, about 50 to 75 percent of the state industry value has come from the production of fresh water food fish, including catfish, striped bass and hybrid striped bass, tilapia, sturgeon and trout (Table 3-1). About 10 percent of the value is derived from marine shellfish, primarily oysters and abalone. Most of the remaining value comes from a variety of non-foodfish products such as baitfish, ornamental fish, and algae developed for use as a nutritional supplement or food additive. While a vast majority of California production involves common aquaculture products, it is worth noting that numerous other species are currently cultured to a lesser extent or have strong candidate status based on successful culture in other parts of the world. These additional species and products are noted in Table 3-2.

Every commercial aquaculture producer in California is required to register with the Department of Fish and Game. CDFG classifies each registrant into one of two categories, marine or freshwater. As of April 2000 there were 220 registered aquaculture facilities in the state, with 176 being classified as freshwater facilities and the remaining 44 being marine projects. In some cases, the same aquaculturist may be registered more than once due to having more than one production facility. The 44 existing marine aquaculture projects are distributed along most of the California seaboard, in 13 counties (Figure 3-1).

Table 3-1. California aquaculture production as reported by three sources.

Source: USDA 1998

	Wholesale Value ($)	Number of Farms
Food Fish	31,143,000	83
Baitfish	2,178,000	7
Ornamental Fish	1,701,000	12
Sport or Game Fish	365,000	9
Other Fish	(withheld)	2
Crustaceans	(withheld)	4
Mollusks	4,710,000	14
Other Animals and Plants	4,271,000	6
Total	43,509,000	120

Source: WRAC 1999

	Wholesale Value ($)	Live Weight (lbs)
Catfish	11,288,000	6,102,000
Trout	5,310,000	2,966,000
Tilapia	8,775,000	4,500,000
Other Food Fish	8,800,000	6,225,000
Non-Foodfish	14,719,000	1,008,000
Aquatic plants	13,760,000	1,037,000
Oysters	4,017,000	7,952,000
Mussels	535,000	458,000
Other shellfish	3,389,000	292,000
Total	70,593,000	30,540,000

Source: CAA 1999

	Wholesale Value		Live Weight	
	($)	(%)	(lbs)	(%)
Catfish	11,000,000	13%	6,240,000	17%
Striped/hybrid bass	9,000,000	11%	3,671,000	10%
Tilapia	7,500,000	9%	3,671,000	10%
Sturgeon	7,000,000	8%	2,569,000	7%
Trout	6,800,000	8%	2,937,000	8%
Shellfish			5,139,000	14%
Oysters	3,900,000	5%		
Abalone	3,200,000	4%		
Other shellfish	1,000,000	1%		
Algae	13,500,000	16%	10,278,000	28%
Other			2,202,000	6%
Baitfish	1,800,000	2%		
Other Food Fish	1,500,000	2%		
Brineshrimp	8,700,000	10%		
Other aquatic animals	6,500,000	8%		
Aquatic plants	2,000,000	2%		
Total	83,400,000	100%	36,707,000	100%

Table 3-2. Common and potential products for the California aquaculture industry.

Freshwater Production	Marine Production
Common Products	*Common Products*
Algae	Oysters
Catfish	Abalone
Striped/hybrid bass	Mussels
Tilapia	Clams
Sturgeon	Scallops
Trout	
Other Products	*Other Products*
Black bass	Limpets
Carp	Urchins
Koi/Goldfish	Halibut
Minnows	Orangemouth Corvina
Mosquito fish	Red Drum
Ornamental fish	Salmon (adults)
Sacramento blackfish	White Seabass
Salmon (juveniles)	Algae
Sunfish/Bluegill	Aquatic plants
Crayfish	
Prawns	
Aquatic plants	
Frogs	
Worms, tubifex	

While there is a great variety of product produced by the industry, all facilities share a common need for consistent, good quality water. Cultured species have well defined and often rigid constraints in their water quality requirements, and ambient conditions such as water temperature, turbidity, dissolved oxygen levels, and cleanliness (especially the absence of human and non-human pathogens) will most often be the primary factor in determining which species might be reared successfully in a given water supply. It should be emphasized that the key to aquaculture production is the ability to sustain water quality conditions. Any departure from these water quality conditions will have a direct impact on the productivity of a facility and ultimately on its long-term economic viability.

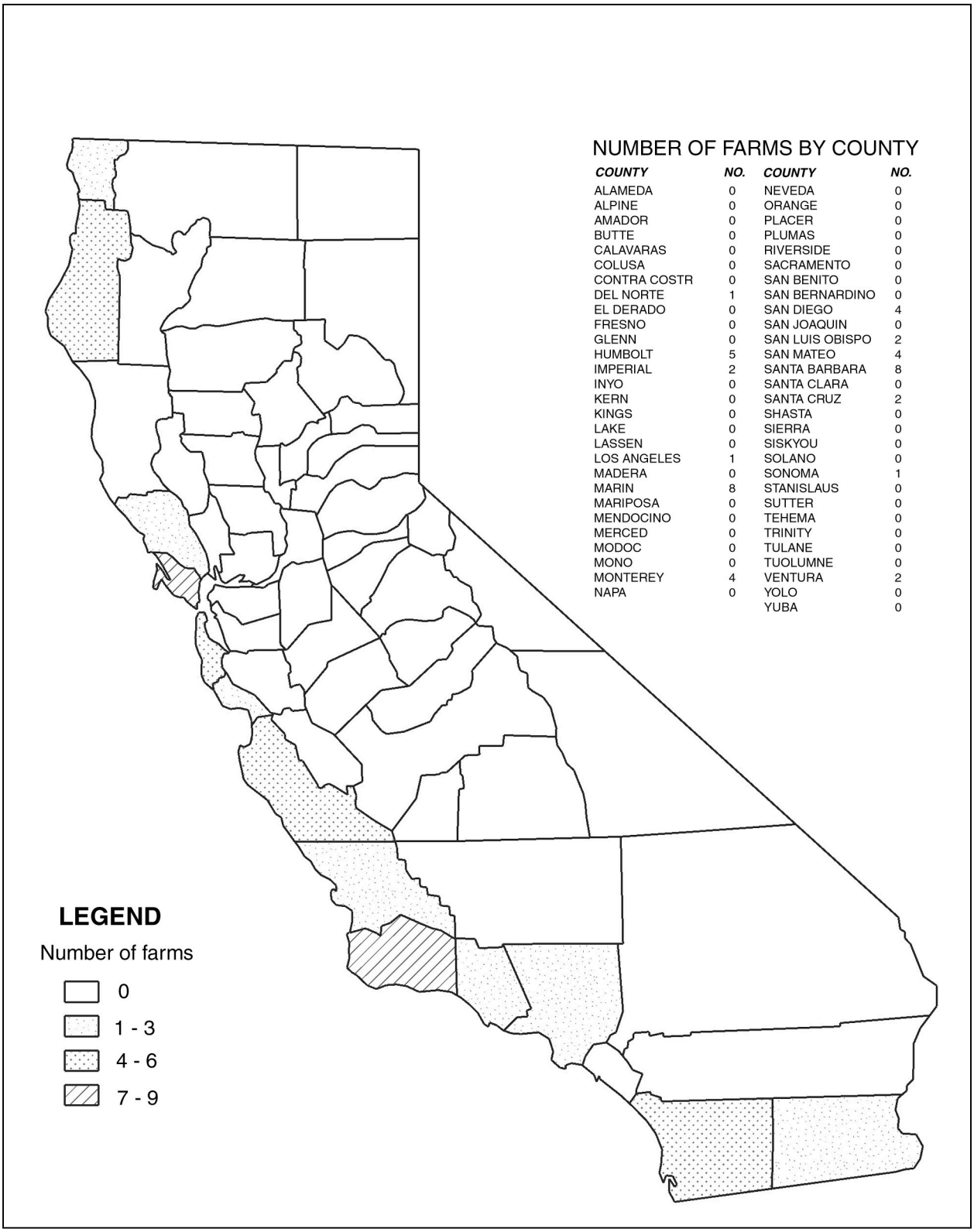

Figure 3-1. Number of marine aquaculture facilities by County in California, April 2000.

3.3 METHODS OF MARINE AQUACULTURE PRODUCTION

Based on the physical characteristics of California's marine environment, in conjunction with State codes that govern aquaculture, an existing or proposed marine aquaculture facility in California is likely to use one of the following five methods for production:

- Bottom Culture
- Off-bottom Culture
- Floating Cages
- Submerged Cages
- Land-based Tanks

Bottom and off-bottom culture are the most common methods of marine aquaculture in California, used for the grow-out of oysters, mussels, clams and scallops. Floating and submerged cages are typically used for the grow-out of finfish, though in California they have also been used for abalone culture. Land-based tanks are used for early rearing for nearly all cultured marine species, as well as for grow-out of certain species such as abalone, and for holding product for retail/wholesale sales.

Ocean ranching is a method of salmon production that is widely practiced in Alaska. It is significantly different from the five methods noted above in that the culture organisms are not confined or sedentary but instead are free ranging over a large ocean area. Ocean ranching is not currently practiced in California, and any new application for ocean ranching would likely be denied due to current protection of wild salmon under the Endangered Species Act. For these reasons, ocean ranching has been purposefully omitted from this Program EIR. An application for ocean ranching would require an individual, project-specific EIR.

The five common methods of marine aquaculture in California have generally similar environmental effects. Furthermore, these effects can be mitigated in similar ways, where necessary. As a means of providing a generalized project description for the marine aquaculture industry, this report will first provide a detailed description of bottom culture. Subsequently, there will be a discussion of the other four rearing methods and how their typical operations would differ from that of bottom culture.

3.4 BOTTOM CULTURE

3.4.1 Physical Setting

Bottom culture is a method used for the production of shellfish, which in the California industry consists mainly of oysters and clams. It is conducted in bays and in open coastal waters located in intertidal and subtidal zones, in legally-defined plots that may be privately owned or leased from other entities. These plots can be anywhere in size from a few acres to thousands of acres. With many operations only a portion of the total plot area is under cultivation at any one time, and the production area is rotated over the entire plot in a cycle that may span several years. While bottom culture accounts for most bivalve shellfish production in the U.S. and historically has been the method used to produce most of the oysters in California, it continues to be gradually replaced by off-bottom methods.

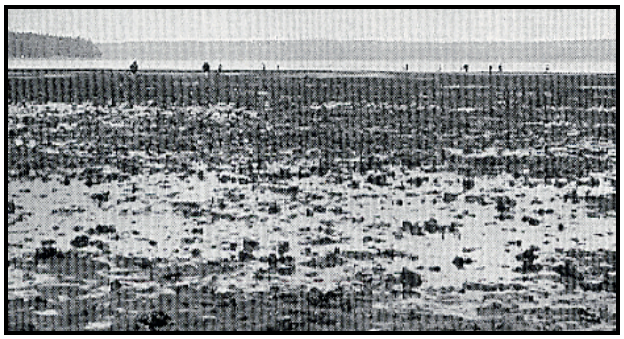

Figure 3-2. A bottom culture facility seen at low tide. (Courtesy Fred Conte and Washington Oyster Industry)

In bottom culture, most shellfish are reared directly on the substrate in the same fashion that the organism would grow in a totally natural environment. A lesser amount are put in nylon mesh bags or strung on groundlines prior to placing them on the substrate. Culture beds are the main components of bottom culture operations (Figure 3-2). As with most aquaculture operations, however, a bottom culture facility will take actions to increase the productivity of an organism, through measures such as controlled seeding and protection against predators. At the same time, a key feature that distinguishes bottom culture from most other methods of aquaculture is that no feed is added to the water. Instead, the shellfish feed only on natural populations of phytoplankton (microscopic algae) that are present in the water.

Site characteristics at a typical bottom culture facility are the same as those that support abundant natural populations of shellfish. These characteristics include the following:

- Tidal levels that vary in the range of +3 feet to –3 feet
- Protection from strong off-shore waves
- Substrate material that is neither too soft (to prevent sinking and smothering) nor, for clam production, too hard (to allow digging in)
- Good water quality with adequate flow exchange to bring in fresh phytoplankton feed and flush out shellfish metabolic wastes
- Predators and pests that are limited in number
- Limited disturbance from other coastal uses, such a boating

Additional site characteristics that facilitate bottom culture operations and increase facility profitability include:

- Substrate surface that is relatively even and gently sloping
- Water quality that falls within the approved classification of the National Shellfish Sanitation Program (NSSP) for production of bivalve shellfish for human consumption

In addition to culture beds, bottom culture operations will also typically require the following shore-based support structures:

- Boat landing and dock
- Equipment storage facilities
- On-shore holding tanks for retail sales

3.4.2 Operational Setting

Bottom culture operations frequently contain two types of culture beds: nursery areas for initial growth, and separate fattening beds for final grow-out. The objective of the nursery area is to maximize survival and growth during the period when oysters are most susceptible to siltation, disease and predators. This might be accomplished by siting the nursery in an area with lower salinity to discourage predators and pests, and

in those areas that are better protected from siltation caused by river flow, excessive run-off, current or wind action.

Seeding of the nursery areas for bottom culture is usually started in the spring. Seed is typically obtained from land-based hatchery facilities, where it is packaged in mesh bags for transport and delivery to a boat landing near the nursery area. Depending on the scale of operations, the seed will be transferred onto a barge or boat by hand or through the use of a crane or forklift.

Seeds are typically spread at high tide to allow the vessel access over the intertidal area. The seed is cast overboard either by shoveling or using a high-pressure hose. The density at which the seed is planted is dependent on a number of factors including species, site productivity, projected mortality of the young seed, and source of the seed. Seeding rates approximate 2 acres per hour, not including the time required for loading the vessel and transport to and from the seeding area.

Usually, product reaches market size in 2 to 3.5 years. During this time, the cultured species can be subject to timed habitat modifications in order to maximize total production. In the case of bottom culture for oyster production, when the oysters reach 2 to 3 inches in length, it is usual to subdivide the oyster clusters into smaller units and redistribute them to reduce the density of oysters. Breaking up the clusters may be done by hand using a metal bar. After the clusters have been separated, they are collected from the nursery area using a suction dredge or hand harvesting, transported by vessel, and distributed over the final grow-out area (fattening grounds). Fattening grounds are often located in subtidal areas to allow the oysters to feed continuously. Typically, the oysters remain on the fattening grounds for about a year.

The final harvest for bottom-cultured product is generally conducted with a standard dredge, a suction dredge, or by hand. Standard dredge operations are conducted at high tide, using a boom and hydraulic winch to lower the dredge, drag it along the bottom, and hoist it back up to the deck. The oysters are dumped from the dredge basket onto the deck, where they are washed and then transported to shore for processing. A standard dredge can harvest about 600 bushels of oysters in a single tide (Conte et al. 1996). This is the method of harvest most commonly used in Washington, the largest oyster-producing state in the nation.

Suction dredges use a combination of water jets and compressed air to lift the dredged material through a tube to the deck of the working barge. The suction dredge rides on sled-runners, and adjustable ballast tanks control the depth to which the teeth extend down into the layers of oysters and substrate. Similar to standard dredge harvest methods, once the oysters reach the deck they are washed and transported to shore.

Hand harvest is commonly conducted with smaller bottom culture operations or where uneven ground prevents use of a dredge; it has been successfully used for decades in Humboldt Bay. Large steel baskets are distributed over the harvest area by boat during high tide. At low tide, workers gather the oysters into small hand baskets that are subsequently emptied into the large steel baskets. The large baskets are collected by boat at the next high tide and then delivered to the processing facility.

Production rates for bottom culture are impacted by mortality due to mid-growth transfers, predators and pests, and other environmental impacts. From seeding to harvest, mortality rates for off-bottom culture of oysters are usually in the range of 15 to

20 percent. Mortality from predators alone is estimated to be about 4 percent, though heavier infestations may take as much as 20 percent. Production of oysters from bottom culture will yield about 1,000 bushels per acre on average. Since 1 bushel of medium-sized oysters yields about 1 gallon of shucked meat, the average production rate equates to 1,000 gallons of shucked meat per acre (Conte et al. 1996).

Bottom culture operations are labor intensive. There are no known estimates of current employment levels at California bottom culture facilities.

3.5 OFF-BOTTOM CULTURE

3.5.1 Physical Setting

Off-bottom culture is a method that can be used for the production of oysters, mussels, scallops or other non-burrowing mollusks, including abalone. It is similar to bottom culture but differs in that it uses structures, containers or other mechanisms to suspend the organisms above the substrate. Key features that distinguish off-bottom culture from bottom-culture facilities include the following:

- Ability to use deeper intertidal and subtidal sites, utilizing the water column in the range of elevation between +1 and –12 feet
- Ability to use sites with soft or uneven substrate
- Distribution of culture organisms throughout the total water column, rather than only on the substrate
- In-water structures that provide physical support, protection, and/or confinement for the cultured organisms

There are several methods that have been used to elevate the organisms above the substrate. Common methods in California include longline culture, rack culture, stake culture, raft culture, and rack and bag culture. A variation of off-bottom culture uses existing offshore oil platforms as a support for attaching bags of culture organisms.

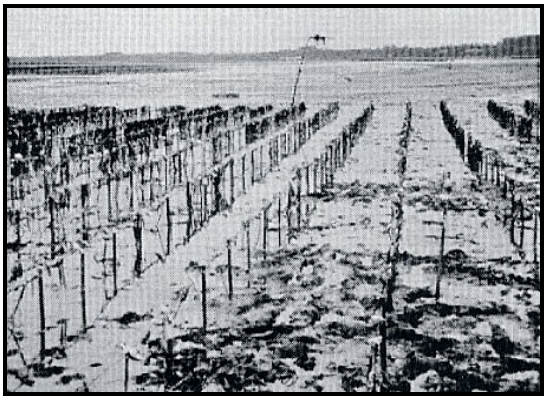

Figure 3-3. An off-bottom culture facility using longlines, seen at low tide. (Courtesy Fred Conte and Washington Oyster Industry)

Longline culture typically consists of long runs of horizontal synthetic line that are suspended about 15 inches above the substrate, with seed clusters embedded in the horizontal line itself or in secondary, vertical lines hung from the horizontal line. Most commonly, the longline is supported by vertical posts driven about a foot into the substrate (Figure 3-3). Alternatively, the longline may be supported by stringing it between floats. An example longline installation in Arcata Bay has 200 foot long lines arranged in groups of four with 2.5 feet between each line, and with 10 foot spacing between each group of four lines (HBHRCD 1999). Because the lines must be maintained, longline facilities are typically sited on good intertidal ground with the line located at an elevation between 0 and +2 feet (Conte et al. 1996).

Figure 3-4. The rack method of off-bottom culture. (Courtesy Fred Conte and Johnson Oyster Company)

Rack culture typically uses long horizontal beams placed about 4 feet above the substrate, with 4 to 6 parallel beams resting on a single support driven into the substrate. Clusters of seed are threaded onto stringers of wire or rope about 8 feet long, and draped over the beams in an inverted "u". Rack culture facilities are generally sited so that the horizontal beams are exposed at low tide, allowing the beams to be walked on during planting and harvest activities (Figure 3-4).

Stake culture consists of seed clusters strung onto a rod, which is driven into the substrate. Where more than one cluster is used, a tube spacer can keep the clusters separated. Often a scallop shell or disk is placed beneath the lowest cluster and buried in the substrate to prevent the stake from sinking or being washed away.

Raft culture uses a floating raft as a support for hanging vertical lines. Seed clusters are embedded into the vertical line, referred to as a stringer.

Rack and bag culture is a method of off-bottom culture that allows development of individual seed (cultchless seed) instead of seed clusters (cultched seed). The cultchless seed is placed within square-creased, polyethylene bags typically measuring 24" x 30" by 3.5" deep, with 3/4 inch mesh. Often five bags are secured to an 8-foot by 2-foot steel rebar frame, forming a unit structure. After loading the bags with seed, each unit is transported to the grow-out area and placed on a rack embedded in the substrate. Periodically, the units are turned over to shuffle the organisms and promote even, symmetrical growth. The racks themselves may be repositioned seasonally to adjust to tidal cycles.

3.5.2 Operational Setting

Off-bottom culture operations are generally similar to bottom culture. Typically, an initial period of nursery rearing is conducted in a protected area, lasting from 1 to 8 months. Regardless of the grow-out method used, almost all nursery rearing is conducted using a rack and bag system, in which the seed is placed inside a 1/8-inch mesh bag and either supported on top of or suspended from a rack. If supported on top of a rack, it is necessary to flip the bags approximately every two weeks to promote uniform growth. Alternative nursery methods include Stanway Shellfish Culture Tubes, which use tidal action to rotate buoyant tubes around a fixed horizontal axle, and a floating upweller system called FLUPSY that is able to rotate seed held in containers using an induced upwelling current. When the nursery organisms reach an appropriate size, they are transported to shore to be placed in the grow-out containment mechanism (such as weaving the seed into longlines) and subsequently transferred to the grow-out area (Conte et al. 1996).

The final grow-out period for off-bottom culture generally lasts from 6 to 16 months. Unlike bottom culture facilities, off-bottom facilities are not harvested through the use

of dredges. Instead, off-bottom harvest is conducted using hand labor and transport vessels. Stringers, stakes, and individual bags are usually light enough to be lifted by hand and loaded onto vessels, while the heavier longlines and rack and bag units usually require a winch to hoist the item onto the vessel. The transport vessel typically unloads the containers and product at a boat landing, where it is stockpiled briefly before transport to the processing facility.

Off-bottom culture operations are labor intensive. Off-bottom culture using cultchless seed is more intensive than using clutched seed. There are no known estimates of current employment levels at California off-bottom culture facilities.

3.6 FLOATING CAGES (NET PENS)

3.6.1 Physical Setting

Floating cage culture is predominantly used for the grow-out of finfish from a juvenile stage to market size, though in California it has also been used for abalone grow-out. One of the most prominent uses of floating cage culture worldwide is in the production of farmed salmon. In 1995 the world production of farmed salmon exceeded 1.2 billion pounds, with more than 80 percent of this production coming out of Norway, Chile and the United Kingdom (BCEAO 1997). Although there are no statutes or regulations precluding commercial production, the use of floating cages in California is currently limited to a few research installations located in power plant discharge canals and to enhancement projects where fish are released into the wild upon their reaching the desired size.

Figure 3-5. An aerial view of a floating cage facility.

Floating cage culture is conducted in coastal waters using mesh enclosures to contain the fish. Natural currents allow water to circulate through the mesh enclosure, bringing fresh oxygen supplies and dispersing wastes. Since the cages are susceptible to damage by large waves or storm surges, it is typical to site floating cage facilities in fairly protected waters. A typical out-of-state commercial facility has a total area that covers about 2 acres, located relatively close to shore to minimize the travel time for daily access by boats. Sites have an average of 10 to 30 cages, most often arranged in two or more parallel rows (Figure 3-5). The cages consists of a square or rectangular steel frame, ranging in length from 10 to 50 feet on each side, supported around the outside by floats made of hollow fiberglass, foam or light-weight concrete. Each cage frame includes a fence railing that extends about 3 feet above the water surface, which is used to support the mesh enclosure. The depth of the mesh enclosure may be anywhere from 15 to 50 feet, depending on the site characteristics. To offer protection from predators, many farms use an additional guard net suspended around

the perimeter of a set of cages (BCEAO 1997; Stickney 1991).

The main access deck for a set of cages is usually four to six feet wide, located between the two parallel rows of cages. Smaller walkways are placed between the cages within a row. A series of anchors is used holds the cage complex in place.

Shore-based support facilities will typically include a boat dock, feed storage facilities, equipment storage facilities, and administrative offices.

3.6.2 Operational Setting

Typical floating cage operations will stock the facility in spring or early summer with juvenile fish obtained from a land-based hatchery. The fish will remain in the cages for 7 to 20 months, depending on the species and specific product desired.

Fish are fed at least twice a day, usually using a dry, extruded feed pellet derived primarily from small, oily fish species. The feeding may be done by hand or automatic feeders. Fish growth and mortalities are monitored closely and used to determine running estimates of total biomass in a cage, and the feed amounts are adjusted accordingly to match fish needs. Underwater cameras are used by some farms to observe food intake and prevent delivery of excess feed. On occasion when fish become sick and require medication, the medication is typically added into the feed.

Periodically, operators will grade the fish and redistribute them to avoid overcrowding in the cages. Grading is typically done using automatic grading equipment, towed to the cage site on a barge as needed. In addition, the nets are changed every few months or so during warmer periods to prevent any loss of circulation that may occur due to growth on the nets of organisms such as mussels, barnacles, algae and kelp. Common methods for cleaning the fouled nets include net washers located either on a barge or onshore, offsite or onsite pressure washers and underwater pressure washers operated by scuba divers. Sometimes nets are dropped to the sea floor where the fouling organisms can be consumed by various sea life predators. Divers conduct frequent excursions to inspect all underwater components of the facilities, including the enclosure nets, predator nets, anchors and mooring lines, and repair them as needed.

Floating cage operations are not particularly labor intensive, though they can provide substantial benefit to individual communities. 1996 data from the salmon aquaculture industry in British Columbia indicates 496 people were employed at grow-out facilities (i.e. floating cage facilities), equating to about 8.8 full-time positions for each million pounds of production. Associated activities provided employment for an additional 646 persons, in hatcheries for the juvenile production, processing plants, transportation, and administration and sales (BCEAO 1997).

3.7 SUBMERGED CAGES

3.7.1 Physical Setting

Submerged cages, like floating cages, can be used for the grow-out of finfish or abalone from a juvenile stage to market size. In California they have so far been used only for the grow-out of abalone. The primary advantage of submerged cages over floating cages is their ability to withstand high-wave, storm events, therefore expanding the potential for facility development at exposed open ocean sites. A second advantage is the reduced visual impact, since surface facilities are much less significant than with

floating cages.

Submersible cages used for abalone culture have evolved from early barrel culture methods. Today's cages typically consist of a rectangular frame covered with heavy gage plastic mesh. Plastic or fiberglass plates are secured within the cage to provide additional surface area for abalone attachment. The cages may be suspended from a fixed or floating dock, raft or longline (UC Davis 1996).

Submersible cages for finfish culture have had limited use in North America. One system that is commercially available in the US consists of a sphere 36 feet in diameter moored to the bottom by means of a wire on each hub. The vertical position of the cage is adjusted by a winch on each end. Under normal conditions the cage is suspended near the water surface, but when storm conditions occur, the cage is lowered below the surface where surges have much less force. Feeding can be conducted by hand or by automatic feeding and monitoring systems. The spherical design allows the cage to be rotated, thereby allowing segments to be periodically exposed to the sun and wind to control biofouling (BCEAO 1997).

Shore-based support facilities for submerged cages would be very similar to those for floating cages, requiring a boat dock, feed storage facilities, equipment storage facilities, and administrative offices.

3.7.2 Operational Setting

Submerged cage operations are similar to those of floating cage facilities. A majority of the effort involves feeding, which must be done manually. California facilities growing abalone in submerged cages typically haul the cages to the surface to feed the animals by hand, and to conduct other husbandry activities. Submerged cage designs for finfish may use a feeding tube to deliver food from the surface. Although advances in technology may allow siting of future submerged cage projects in open ocean locations, historically, sites that protect submerged cages from strong waves and surge while allowing for flushing by currents and tidal action have been preferred. Open ocean siting would likely require longer travel distances between the loading dock and cage facilities. Due to the difficulty of gaining direct access to product in submerged cages, it is likely that product monitoring, grading, cage transfers and removal of mortalities would be conducted less frequently or less effectively, potentially effecting affecting productivity and economic return.

3.8 LAND-BASED TANKS

Land-based tanks are used for all three of the main phases of marine aquaculture: broodstock maintenance, hatchery and nursery operations, and grow-out. In addition, land-based tanks may be used for algae production, either as a means of providing feed for hatchery or broodstock operations, or as a commercial product itself.

3.8.1 Physical Setting

In the most basic form, land-based tank facilities consist of submerged saltwater intakes, pumps and pipelines, rearing tanks, effluent structures, and support buildings. Depending on project needs, additional components may provide oxygenation, removal of solid wastes, removal of nitrogenous wastes, disinfection with ultraviolet light or ozone, temperature modification, and water recirculation. Generally, these components

increase the capital cost and operating complexity of the facility and a point will be reached at which the cost of operations can not be afforded by the market price of the product.

Figure 3-6. A nursery facility using indoor on-shore tanks. (Courtesy The Abalone Farm)

Figure 3-7. Outdoor on-shore tanks. (Courtesy The Abalone Farm)

The design of rearing tanks can be highly variable and will be largely dependent on the operational function. In general, hatchery operations and algae production will use small tanks having volumes of 5 to 100 gallons and constructed of fiberglass, plastic, stainless steel or aluminum. Medium size tanks ranging from 150 to 1,000 gallons are more typical for broodstock maintenance, nursery rearing of shellfish, and fingerling rearing of finfish. These types of operations often require stringent control of lighting, water temperature, and cleanliness, and consequently it is typical to locate these facilities inside a building (Figure 3-6).

The use of land-based tanks for growout of marine species is generally not feasible economically, except when the product has a very high market value. This is the current situation with the California abalone industry, which in 1999 produced about 225,000 pounds of live product almost exclusively through the use of land-based tanks. A common design of the growout tank is a concrete raceway, with individual units having typical dimensions of 8 feet wide by 24 feet long by 3 feet deep, arranged one after the other in a series that may be several hundred feet long so that water is reused many times.

It is also common to arrange several raceway series side by side to share a common wall and reduce the amount of concrete required for construction (Figure 3-7). The raceways may be equipped with removable baskets that subdivide the raceway units into smaller compartments for juvenile rearing. Generally, the growout tanks are located outdoors and arranged to allow vehicular access for feed delivery, harvest and transfers. Growout facilities also require substantial space for feed storage, which in the case of abalone production will typically consist of another raceway or storage tank dedicated to holding kelp.

3.8.2 Operational Setting

Hatchery operations are periodic operations typically conducted one to three times a year, lasting up to three months at each occurrence. Broodstock maintenance and commercial algae production are likely to occur year-round. In all these cases, the required flow rates are relatively small, rarely exceeding a few hundred gallons per minute. Much more important is the need for high-quality, highly regulated water supplies. These operations usually include equipment for water supply pumping, filtration, disinfection and temperature control, as well as back-up power facilities to insure continued facility operation during commercial power outages. Daily operations involve frequent monitoring of water quality, inspection and maintenance of sophisticated equipment, numerous feedings per day, and stringent cleaning protocols to minimize potential contamination. These operations are traditionally the most labor-intensive aspect of aquaculture.

Grow-out operations at land-based tank facilities may require several years before the product reaches market size. Abalone require 4 years on average to reach a harvestable size of 3-1/4 inches, with the slower growers taking as long as 6 years. Feeding for abalone production is conducted three times a week by replacing any uneaten kelp with a fresh supply. Tank cleaning requirements consist primarily of removal of accumulated sediment, which can be facilitated by forced-air systems located at the bottom of the tanks that provide intermittent aeration, agitation and resuspension and flushing of solids. Individual animals are monitored periodically for growth and disease, and mortalities are removed whenever found. Once or twice a year the animals are graded and redistributed to reduce loading densities and maintain uniform size in a rearing tank. Since these facilities may require water supply flow rates upwards of a few thousand gallons per minute, it is essential that pumping equipment, intake systems, and back-up power generators be inspected frequently and repaired as necessary.

Effluent discharge requirements for land-based tank facilities in California have been generally limited to screening. Screens with slot widths of 1/4 inch have been placed in the discharge lines of abalone grow-out facilities to prevent animals, kelp or shell fragments from leaving the facility.

Land-based tank operations are not especially labor intensive in relation to the value of the product. It is estimated that the typical marine land-based tank facility in California may employ 25 to 35 people.

SECTION 4. PROGRAM ALTERNATIVES AND MITIGATION STRATEGIES

4.1 PROGRAM ALTERNATIVES

Two program alternatives were considered for this PEIR: the No-Project Alternative and the Preferred Alternative.

4.1.1 No–Project Alternative

The No-Project Alternative assumes that no new aquaculture projects will be approved in California, and that the industry will continue at existing facilities and at present levels of production. The No-Project Alternative is used as a basis for comparison to the Preferred Alternative, allowing continued growth of the industry. The purpose of this comparison is to highlight changes to existing conditions.

4.1.2 Preferred Alternative

The Preferred Alternative consists of approving new project applications through the current set of regulations governing the aquaculture industry, with a recognition that appropriate site-specific mitigation shall be developed in the course of approving discretionary permits for the individual project. Table 4-1 provides a summary of the impact potential for each of the five typical categories of marine aquaculture production, based on a more detailed discussion of impacts presented in Section 5. The table also identifies the permit and regulations that typically establish operational requirements and/or mitigation measures that reduce potential impacts to less-than-significant levels.

The preference for continued growth in the California aquaculture industry is broadly reflected in aquaculture policies of both the U.S. Department of Commerce and the California Public Resources Code (see Section 3.1). Table 4-2 provides a summary of the beneficial impacts of the preferred alternative in comparison to the No-Project Alternative.

4.2 MITIGATION STRATEGIES FOR THE PREFERRED ALTERNATIVE

Because this Program EIR does not evaluate site-specific actions, no specific mitigation measures are presented. Instead, general mitigation strategies are identified that provide ways to avoid, minimize, restore or compensate for potentially significant impacts. Table 4-3 provides a summary of these potentially significant impacts along with associated mitigation strategies that have been used in recent permits for approved aquaculture projects. A more detailed description of these mitigation measures is provided Section 5.

Table 4-1. Impact potential and associated governance for marine aquaculture facilities.

Resource Category (PEIR Section Number)	Impact Potential of Aquaculture Facilities **without** Mitigation or Regulatory Measures Severity of Impact: ○ Low, ◗ Medium, ● High Likelihood of Occurrence: ❑ Low, ▮ Medium, ■ High					Permit or Regulation that Typically Significantly Reduces Severity of Impact and /or Likelihood of Occurrence
	Bottom Culture	Off-bottom Culture	Floating Cages	Submerged Cages	Land-based Tanks	
Aesthetics (5.2)	○ ▮	● ■	● ■	◗ ■	● ■	Coastal Development Permit issued through local government or California Coastal Commission
Agricultural Resources (5.3)	○ ❑	○ ❑	○ ❑	○ ❑	○ ❑	
Air Quality (5.4)	○ ❑	○ ❑	○ ❑	○ ❑	◗ ▮	Authority to Construct issued by county or regional Air Pollution Control District
Biological Resources (5.5)						
Sensitive Habitat	● ▮	◗ ▮	◗ ▮	◗ ❑	◗ ▮	Coastal Development Permit; USCOE Form 4345; CDFG Streambed Alteration Agreement
Fish Migration and Habitat	◗ ▮	◗ ▮	○ ❑	○ ❑	◗ ▮	Coastal Development Permit; USCOE Form 4345; NMFS and USFWS review
Bird Migration and Habitat	◗ ■	◗ ■	○ ▮	○ ❑	○ ▮	Coastal Development Permit; USCOE Form 4345; USFWS review
Predator Species	○ ■	○ ■	◗ ■	○ ▮	◗ ■	Depredation permits issued by USFWS or NMFS
Special Status Species	◗ ■	○ ■	○ ▮	○ ▮	◗ ▮	Coastal Development Permit may trigger review by USFWS, NMFS and CDFG
Introduction of Exotic Species	● ▮	● ▮	● ▮	● ▮	● ▮	CDFG Aquaculture Registration; CDFG Permit for Exotic or Prohibited Species
Disease Transmission	◗ ❑	◗ ❑	◗ ▮	◗ ▮	◗ ▮	CDFG Aquaculture Registration; CDFG Importation Permits and Health Certificates
Escapement	● ❑	● ❑	● ▮	● ▮	● ▮	CDFG Aquaculture Registration
Cultural Resources (5.6)	◗ ▮	◗ ▮	◗ ❑	◗ ❑	◗ ▮	Identification of site-specific resources during initial consultation with local government
Geology and Soils (5.7)	◗ ❑	○ ❑	○ ❑	○ ❑	◗ ❑	Local government review for seismic issues; Coastal Development Permit for soil erosion issues

(continues next page)

Table 4-1. (Cont.)

Resource Category (PEIR Section Number)	Impact Potential of Aquaculture Facilities **without** Mitigation or Regulatory Measures Severity of Impact: ❍ Low, ◗ Medium, ● High Likelihood of Occurrence: ❑ Low, ▮ Medium, ■ High										Permit or Regulation that Typically Significantly Reduces Severity of Impact and /or Likelihood of Occurrence
	Bottom Culture		Off-bottom Culture		Floating Cages		Submerged Cages		Land-based Tanks		
Hazards and Hazardous Materials (5.8)	❍	❑	❍	❑	❍	❑	❍	❑	◗	❑	Regional Water Quality Control Plans and NPDES permits; USFDA regulations re drug use
Hydrology and Water Quality (5.9)											
Water Supply	❍	❑	❍	❑	❍	❑	❍	❑	❍	❑	Regional Water Quality Control Plans
Waste Discharges	❍	❑	❍	❑	●	■	◗	▮	◗	■	Regional Water Quality Control Plans and NPDES permit
Stormwater Discharges	❍	❑	❍	❑	❍	❑	❍	❑	◗	▮	Regional Water Quality Control Plans and NPDES permit
Land Use and Planning (5.10)	◗	■	◗	■	❍	▮	❍	▮	◗	■	Coastal Development Permit issued through local government or California Coastal Commission
Mineral Resources (5.11)	❍	❑	◗	❑	❍	❑	❍	❑	◗	❑	State Lands Commision review of lease area
Noise (5.12)	❍	❑	❍	❑	◗	▮	❍	❑	◗	▮	Local government ordinances
Population and Housing (5.13)	❍	❑	❍	❑	❍	❑	❍	❑	❍	❑	
Public Services (5.14)	❍	❑	❍	❑	❍	❑	❍	❑	❍	❑	
Recreation (5.15)	●	▮	●	▮	◗	▮	◗	▮	❍	❑	Coastal Development Permit issued through local government or California Coastal Commission
Transportation and Traffic (5.16)	❍	▮	❍	▮	◗	▮	◗	▮	❍	❑	US Coast Guard Private Aids to Navigation Permit
Utilities and Service Systems (5.17)	❍	❑	❍	❑	❍	❑	❍	❑	❍	❑	
Growth Inducing Impacts (5.18)	❍	❑	❍	❑	❍	❑	❍	❑	❍	❑	

Table 4-2. Summary of beneficial impacts of the preferred alternative.

Resource Category	Beneficial Impacts
Agricultural Resources	Continued enhancement of aquaculture technologies will promote diversification and subsequently encourage best use of agricultural resources.
Biological Resources	
Sensitive Habitat	Current research is evaluating potential beneficial effects of off-bottom culture methods on eelgrass habitat through nutrient loading.
Fish Migration and Habitat	In-water structures create new habitat for aquatic organisms such as algae, invertebrates, crab and fish.
Bird Migration and Habitat	In-water structures create new habitat for aquatic organisms such as algae, invertebrates, crab and fish, which in turn become food for diving birds. Aquaculture product located in outdoor exposed rearing units creates a food source for predatory birds.
Special Status Species	Aquaculture is contributing efforts to restoration and enhancement programs for listed species.
Fishery Resources	Availability of aquaculture products may reduce demand for depleted natural fisheries resources, which may help restore and maintain sustainable wild stock fisheries.
Hydrology and Water Quality	Required monitoring of bivalve shellfish projects provides ongoing measurement of water quality allowing discovery and elimination of pollution sources.
Economic and Social Effects	
Agricultural Economics	Enhances agricultural revenues.
Regional Economics	Generally benefits regional economies through employment, often in rural areas.
National Economics	Increases in domestic aquaculture production will help offset the $6 billion annual U.S. trade deficit in seafood.

Table 4-3. Summary of potentially significant adverse impacts and associated potential mitigation measures.

Potentially Significant Adverse Impact (and Nos. of Potential Mitigation Measures)	Potential Mitigation Measures
Potential impact to scenic view or perceived visual character of an area (1)	1. Use of visual screening methods such as tree plantings, site layout, or natural coloration in structures
Potential impact to sensitive species or sensitive habitat such as eelgrass beds, benthic invertebrate habitat, wetland or riparian habitat (2, 3, 4, 9)	2. Avoidance to the maximum extent feasible of locating any operations within areas containing sensitive habitat.
Potential impact to habitat access and potentially altered flow conditions from placement of in-water structures (3, 4)	3. Implementation of a monitoring plan to assure there is no impact, with provision to reduce production and/or alter operations if impact is observed.
Potential introduction of exotic species (5, 6)	4. Funding of on-site evaluations to obtain additional information regarding potential impacts and need for mitigation
Potential transmission of disease to native populations from aquacultured organisms (6, 7)	5. Implementation of special conditions through CDFG review and approval of Aquaculture Registration application
Potential impact to native populations from competition for food sources and habitat due to escpapement of aquacultured organisms (5, 8)	6. Requirement that stock be obtained from disease-free source
Potential impact to genetic integrity of native populations due to escpapement and interbreeding with aquacultured organisms (5, 8)	7. Treatment of on-site pathogenic events through proscribed doses of approved drugs using protocols that do not impact adjacent wildlife resources
Short-term increase in turbidity resulting from harvest operations or construction activities (10, 11)	8. Use of secure methods to prevent escapement, including double-hung netting, redundant cage anchors, and effluent screening
Potential impact to water quality from facility discharge (11, 12, 13)	9. Limiting construction activities to windows of minimal species vulnerability
	10. Limiting harvest activities to certain operational methods and certain time periods
	11. Implementing BMPs such as stormwater pollution prevention plans, erosion control plans and spill prevention plans
	12. Siting of facilities to assure adequate water flow for dispersal of both natural feed and wastes
	13. Construction of effluent treatment facilities to ensure compliance with water quality discharge standards

SECTION 5. ENVIRONMENTAL REVIEW

5.1 APPROACH TO ENVIRONMENTAL ASSESSMENT

This chapter of the PEIR analyzes and describes the potential environmental impacts associated with implementation of proposed coastal aquaculture projects. The environmental assessment is organized using the same 16 resource categories defined in the Environmental Checklist presented in the 1998 amendment of the CEQA Guidelines. Within each section (addressing an individual resource category), the questions contained in the Environmental Checklist are provided first, followed by a discussion of the environmental setting, the regulatory framework, and the potential environmental impacts and associated recommended mitigation measures. The checklist prompts the reviewer to examine a spectrum of activities that potentially could result in significant environmental effects if they were to occur with the project. It is important to note, however, that the checklist does **not** represent an all-inclusive list of potentially significant environmental effects, and this PEIR addresses additional activities not identified on the checklist that are common in the aquaculture industry.

A key aspect of the CEQA analysis is determining whether or not an activity may result in a significant adverse environmental effect. CEQA regulations purposefully do not define specific thresholds of significance, because the significance of an activity may vary with the setting. Instead, CEQA regulations authorize and encourage local governments to adopt thresholds that most appropriately reflect local and agency policies. A threshold of significance can be defined as a quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined. A threshold may be based on standards such as the following (GOPR 1994):

- A health-based standard such as water pollutant discharge standards, air pollutant emission standards, or noise levels.
- Service capacity standards such as traffic level of service, water supply capacity, or waste treatment plant capacity.
- Ecological tolerance standards such as physical carrying capacity, impacts on declared threatened or endangered species, or wetland encroachment.

It is the intent of the California Environmental Quality Act (CEQA) to focus on significant adverse effects. Therefore, mitigation is only required when significant adverse effects are anticipated. Wherever possible, this PEIR identifies specific thresholds that have been used in the programmatic determination of significance. The PEIR subsequently identifies mitigation measures that might be useful in reducing the adverse effects to levels that are less than the threshold of significance for each issue described.

Programmatic characteristics of the marine aquaculture industry suggest the potential for significant adverse effects is greatest in three resource categories: Aesthetics, Biological Resources, and Hydrology and Water Quality. As a means to provide a concise summary of the issues that may occur in these three resource categories, the environmental impacts discussion for these categories conclude with a table itemizing

the issues, the thresholds of significance used in the analysis of effects, and the associated mitigation measures that ensure an adequate reduction of impacts. The table indicates that, in many cases, these thresholds of significance will be based on local regulation, and/or they will require site-specific evaluation at the individual project level. Mitigation plans developed for individual marine aquaculture projects, where necessary, will take into account specific relevant characteristics of the proposed individual project, such as the production level or the presence of sensitive habitat.

5.2 AESTHETICS

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☒	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☒	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☒	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

5.2.1 Environmental Setting

Aesthetics typically refers to the perceived visual character of an area, such as the scenic view, open space, or architectural facade. The physical characteristics of a landscape determine its scenic quality and its relevant value to the viewing public. These characteristics can be of both natural and manmade features. Natural features include water, landform, vegetation, and soils. Manmade features include physical structures, roads, and so on. Since scenic quality is an element of human sensory experience, the most important visual resources are those within the view of both existing and potential areas accessible to people (roadways, rivers, trails, recreation sites, and human developments). The focus of attention is on unusual and high-quality visual resources, such as ocean views, scenic vistas, mountainous terrain, steep slopes, natural drainages and waterways, interesting patterns of vegetation, and rock formations, that play a dominant role in characterizing a particular scene in the context of the surrounding landscape.

The aesthetics of California's coastal areas vary widely and are considered to be one of the most important scenic features of the state. The coastline is comprised of coastal mountains, streams and rivers, marine terraces, bluffs and headlands, coastal sand dunes, beaches, wetlands, the rocky intertidal, islands and offshore rocks, and tidepools, all of which are considered to be of high scenic value.

5.2.2 Regulatory Framework

Preservation of California's scenic coastal areas is a clearly defined objective in the California Coastal Act and is implemented at the local government level. Any person or public agency planning development within the coastal zone must obtain a Coastal Development Permit from either the Coastal Commission or the city or county having authority to issue coastal development permits. In general, the coastal zone extends three miles seaward to approximately 1,000 yards inland from mean high tide. Whenever development is undertaken, it must be in compliance with the California Coastal Act and specifically with Section 30251.

The California Coastal Act, Section 30251, states that:

> *"The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting."*

Local Coastal Plans (LCPs) will also specify local scenic areas and development criteria. When reviewing coastal development permit applications, local governments will consider the visual impacts associated with aquaculture facilities on a case-by-case and site-specific basis.

5.2.3 Environmental Impacts

The most common methods of marine aquaculture in California are bottom and off-bottom culture. Bottom culture projects are located in intertidal and subtidal areas of the coastal zone. They range in size from a few acres to thousands of acres. During low tide, a bottom culture facility will not have the same natural appearance as an eelgrass bed or unvegetated mudflat, and there will most likely be some evidence of low-profile, constructed facilities such as small dikes, nursery bags, bottom netting, or bat-ray fencing.

Projects utilizing off-bottom culture are located in areas similar to bottom culture. There are several methods of off-bottom culture, including longline, rack, stake, raft, and rack and bag. All of these methods include the suspension of some form of container or structure in the water column, suspended above the substrate. Small structures such as buoys, racks, stakes, and net bags may be visible for all or part of the tidal cycle.

Floating cage projects, used predominately for the production of farmed salmon, are typically about two acres in size and located in protected, nearshore waters. There are generally 10 to 30 cages set in two parallel lines. The cages are 10 to 50 feet in length with a depth of 15 to 50 feet. Floats, generally constructed of fiberglass or lightweight concrete, support the cages. A fence railing that extends approximately 3 feet above the water surface is used for structural support. Walkways and cage tops are above the surface and would generally be visible from the shore.

Submerged cages differ from floating cages in that there are few structural components visible above the waterline. Submerged cage units are generally 20 to 30 feet square and 15 feet in height, suspended 6 to 15 feet below the surface and held in place by mooring buoys or support rafts. These buoys and rafts are typically the only visible items of a submerged cage project. Most existing submerged cage projects in California are located in protected, nearshore waters, but there are also submerged cage systems capable of being located in higher energy zones further from shore.

The final category of marine aquaculture methods consists of land-based tanks. These projects will typically include a submerged salt water intake, pumps, pipelines, rearing tanks, discharge structures, and maintenance buildings. The dominant form of land-based tanks in California is the concrete raceway. Individual raceway units are

generally about 8 feet wide by 24 feet long by 3 feet deep. They are often arranged in a parallel, common-wall configuration with multiple series in a row, and they are frequently recessed fully or partially below the ground surface.

Marine aquaculture has been practiced in California since the mid-1800s and will define the historical use of some coastal areas. In such cases, it is likely that aquaculture will have contributed to the culture and "local color" of an area. The aspects of aquaculture as a way of life should be considered during the review of aesthetic issues for an individual project application.

Depending on the location, the appearance of a marine aquaculture project could represent a significant adverse effect requiring site-specific mitigation to reduce the visual impact to the viewing public. The level of mitigation required will be dependent on threshold criteria for scenic and visual qualities defined in the Local Coastal Plan. The following mitigation measures may be useful in reducing the visual impact of a marine aquaculture project to levels that are less than significant:

- Avoidance or reduced size of sites located within designated highly scenic areas.
- Limiting the height of structures below an established standard to reduce the vertical profile of a project when viewed from a distance.
- Use of construction materials that have a coloration consistent with the natural background.
- Use of tree plantings or other landscaping methods to provide a visual screen of facilities.
- Use of natural-colored shade cloth or fencing materials to conceal visible structures.
- Enhancement of visually degraded areas located on the site, such as the removal of abandoned facilities.

5.2.4 Summary Discussion of Thresholds of Significance and Mitigation Measures

The extent to which a coastal marine aquaculture facility may have a significant adverse effect on aesthetic resources is dependent on site-specific characteristics. During review of an individual aquaculture project, the local permitting agency will ensure compliance with local scenic elements and other relevant aspects of the Local Coastal Plan (LCP). The following table reiterates the aesthetic issues raised in the environmental checklist, provides a sample threshold of significance, and summarizes mitigation measures that, when necessary, can be applied on a case-by-case basis to reduce the aesthetic impacts to levels that are less than significant.

Issue	Potential Threshold of Significance	Potential Mitigation Measures to Reduce Impact to Less than Significant
Adverse effect on scenic vista	Site is located within an area of outstanding scenic value identified in the Local Coastal Plan, and proposed project is deemed to have a significant visual impact on the scenic value.	• Selectively locate facilities in less prominent areas • Reduce size or height of facilities • Use visual screens or natural coloration • Enhance visually degraded areas
Damage to scenic resources such as trees and rock outcroppings	Site is located within an area of outstanding scenic value and/or it contains specific scenic elements identified in the Local Coastal Plan, and proposed project will cause damage to the scenic resource.	• Selectively locate facilities to avoid the scenic resource • Reduce size or height of facilities
Degradation of existing quality of site and its surroundings	Site development degrades unique characteristic of site; for example, it curtails public access to major recreational areas or open-space reservations identified in the Local Coastal Plan.	• Locate facility components to avoid the quality element • Provide design features that enhance the quality element
New source of substantial light or glare	Proposed site development exceeds illumination limitations identified in the Local Coastal Plan.	• Reduce lighting level below accepted standard • Reduce impact through selective siting and/or visual screening

5.3 AGRICULTURAL RESOURCES

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	☒

5.3.1 Environmental Setting

California is the nation's leading agricultural state, with $26.8 billion worth of total production and income in 1997 (California Department of Food and Agriculture 1997). The variety of climates and soils in the state, together with the long growing season and availability of water, make it suitable for growing a wide variety of crops. The major crops produced include asparagus, cotton, citrus, grapes, lettuce, nuts, stone fruits (e.g., almonds and plums), strawberries, and tomatoes. Poultry, dairy, and beef cattle are also important products.

The commercial aquaculture industry is a form of agriculture present throughout California, producing a wide variety of aquatic plants and animals in salt water, brackish water and fresh water. Recent estimates of the wholesale value of California aquaculture production range from a low of $45 million reported in the 1998 national census (USDA 1998), to a midrange value of $71 million reported for 1997 by the Western Regional Aquaculture Center (Toba and Chew 1999), to a high of $83 million reported for 1998 by the California Aquaculture Association (CAA 1999). In April 2000 there were 220 existing registered aquaculture facilities in the state, with 44 of these facilities (20%) being marine projects located along the coast. A listing of the marine products most commonly marketed at present is noted below, along with other products produced in California in recent years.

Commonly Produced Products	*Other Products*
Oysters	Limpets
Abalone	Urchins
Mussels	Halibut
Clams	Orangemouth Corvina
Scallops	Red Drum
	Salmon (adults)
	White Seabass
	Algae and Aquatic Plants

5.3.2 Regulatory Framework

Agriculture is one of the most important industries in California and a number of laws and regulations have been implemented to help preserve agricultural lands throughout the state. Two laws that could potentially regulate aquaculture programs within the coastal zone are the California Coastal Act and the Williamson Act.

The California Coastal Act clearly establishes aquaculture as a priority use in the coastal zone. Section 30222.5 states:

> *"Ocean front land that is suitable for coastal-dependent aquaculture shall be protected for that use, and proposals for aquaculture facilities located on those sites shall be given priority, except over other coastal-dependent developments or uses."*

The Act also specifically encourages the local protection of agricultural lands, as stated in Section 30242 and Section 30243. Section 30242 states:

> *"All other lands suitable for agricultural use shall not be converted to nonagricultural uses unless (1) continued or renewed agricultural use is not feasible, or (2) such conversion would preserve prime agricultural land or concentrate development consistent with Section 30250. Any such permitted conversion shall be compatible with continued agricultural use on surrounding lands."*

Section 30243 states:

> *"The long-term productivity of soils and timberland shall be protected, and conversions of coastal commercial timberlands in units of commercial size to other uses of their division into units of noncommercial size shall be limited to providing for necessary timber processing and related facilities."*

The Land Conservation Act or Williamson Act applies to onshore lands and is typically regarded as a means to limit the uses of specific private lands to farming and ranching uses over medium-term periods of time. The originators of the Act envisioned a means for local governments to integrate the protection of open space and agricultural resources into their overall strategies for planning urban growth patterns. The three principal objectives were originally:

- Protection of agricultural resources,
- Preservation of open space land, and
- Promotion of efficient urban growth patterns.

The Williamson Act allows local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive lower property taxes. Local governments receive an annual subvention of forgone property tax revenues from the State via the Open Space Subvention Act of 1971.

Various California code sections (e.g. Public Resources Code Section 30100.2 and Fish and Game Code Section 17) establish aquaculture as a form of agriculture. Food and Agriculture Code Section 23.5 states:

> *"The commercial production of fish propagated and raised by a registered aquaculturist pursuant to Section 15101 of the Fish and Game Code in the state is a growing industry and provides a healthful and nutritious food product, and, as a commercial operation, utilizes management, land, water, and feed as do other agricultural enterprises. Therefore, the commercial production of that fish and marine life shall be considered a branch of the agricultural industry of the state for the purposes of any law which provides for the benefit or protection of the agricultural industry of the state except those laws relating to plant quarantine or pest control."*

5.3.3 Environmental Impacts

Aquaculture is considered by code to be a branch of the agriculture industry. Proposed projects involving a marine aquaculture facility will therefore have a designated agricultural use and consequently should have no adverse impact on the agricultural resources of the state. Construction and implementation of marine aquaculture projects a) will not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance; b) will not conflict with existing zoning for agricultural use, or a Williamson Act contract; and c) will not involve other changes in the existing environment which, due to the nature of aquaculture, will result in a conversion to non-agricultural use. Therefore, no impacts will occur.

5.4 AIR QUALITY

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the proposal:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

5.4.1 Environmental Setting

The strong influence of the Pacific Ocean, the Coastal Range, the Sierra Nevada and the Cascade Range provide climatic variations in California that run in a general west-to-east direction. California's climate varies from Mediterranean (coastally and most of the state) to steppe (scattered foothills areas) to alpine (high Sierra and Cascade).

The Sierra Nevada and Cascade Range act as barriers to the passage of air masses. In summer, California is protected from much of the hot, dry air masses that develop over the central United States. Because of this barrier and its western border with the Pacific Ocean, portions of the state have a generally milder summer climate than other parts of the country. Summers are characterized by dry, sunny conditions with infrequent rainfall. In the winter, the Sierra Nevada and Cascade Range block cold, dry air masses located in the interior of the United States from moving into California. Consequently, winters in California are milder than would be expected at these latitudes. During winter, inversions can cause the buildup of carbon monoxide and particulates. These barriers often lead to stagnant atmospheric conditions that can cause the formation of smog.

Atmospheric and topographic conditions that create temperature inversions and permit stagnant air masses to remain for long periods allow the concentration of pollutants to increase. This aggravates pollutant concentration over urban, industrial, and agricultural areas. Air pollution in California is occasionally aggravated by its daily and seasonal wind patterns. Sea breezes move air pollution inland from coastal areas during the day, as cold dense air moves onshore. Land breezes push pollution back to

coastal areas during the night.

5.4.2 Regulatory Framework

5.4.2.1 Air Quality Standards

The USEPA has set national ambient air quality standards (NAAQS) for ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, respirable particulate matter (PM10), and airborne lead. An area where the NAAQS for a pollutant is exceeded is considered a nonattainment area and is subject to planning and pollution control requirements that are more stringent than normal requirements.

In addition to the NAAQS, the California Air Resources Board (CARB) has established State Ambient Air Quality Standards (SAAQS) to protect public health and welfare. Standards have been set for ozone, sulfur dioxide, PM10, sulfates, airborne lead, hydrogen sulfide, and vinyl chloride at levels designed to protect the most sensitive members of the population, particularly children, the elderly, and people who suffer from lung or heart diseases. The CARB is responsible for control program oversight activities, while regional air pollution control districts are responsible for air quality planning and enforcement. In addition, the CARB is responsible for assigning air basin attainment and non-attainment designations with respect to the State air quality standards based on the criteria adopted by the CARB and contained in Title 17 of the California Code of Regulations. Air basins are designated as being in attainment if the levels of a criteria air pollutant meet the SAAQS for the pollutant, and are designated as being in non-attainment if the level of a criteria air pollutant is higher than the SAAQs. Therefore, an air basin may have acceptable levels of one criteria air pollutant but unacceptable levels of one or more other criteria air pollutants, and can be both in attainment and non-attainment at the same time.

State and national air quality standards consist of two parts: an allowable concentration of a pollutant and an averaging time over which the concentration is to be measured. The allowable concentrations are based on the results of studies of the effects of the pollutants on human health, crops and vegetation, and, in some cases, damage to paint and other materials. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (e.g., 1 hour), or to a relatively lower average concentration over a longer period (e.g., 8 hours, 24 hours, or 1 month). For some pollutants, there is more than one air quality standard, reflecting both its short-term and long-term effects.

5.4.2.2 Permitting Process

Any person or public entity proposing to construct, modify, or operate a facility or equipment that may emit pollutants from a stationary source into the atmosphere must obtain an Authority to Construct from the county or regional air pollution control district (APCD) or air quality management district (AQMD). Air districts issue permits and monitor new and modified sources of air pollution to ensure compliance with Federal, State, and local emission standards. Each air district determines which emission sources and levels have significant impacts on air quality and, therefore, are exempt from permit requirements. Local air districts also determine appropriate best available technology that must be applied to specific equipment, and/or other mitigation measures that must be applied.

5.4.3 Environmental Impacts

The only stationary source of air emissions at marine aquaculture facilities would be back-up power generators used to provide power to pumping equipment during power outages. Pumps are used for land-based marine facilities, but not for bottom, off-bottom, floating cages or submerged cages. Back-up power generators are usually fueled by diesel, though propane is used on some occasions. Power generators require air permits from the local air districts and would therefore be required to implement appropriate mitigation to ensure compliance with Federal and State air standards. With the implementation of mitigation required by the local air districts, impacts would be reduced to less than significant.

Other minor sources of emissions could come from the boats or trucks used to service the facilities. Boat use generally involves one hour per day on average, and perhaps up to several hours during seeding or harvesting periods. Truck use on land-based marine facilities typically involves driving by the rearing units two times per day with the feed trucks; periodic deliveries to and from the site for feed, supplies, and product; and periodic operations and maintenance activities such as pond harvest, fish transfers, and lawn maintenance. The contribution of air emissions from the limited use of these few vessels and trucks is not considered to be significant.

Aquaculture facilities in general do not result in the generation of odor. An exception could be associated with land-based tanks, where odors could occur if routine maintenance (such as cleaning up spilled feed or proper disposal of fish carcasses) were not performed. The significance would depend on the location of sensitive resources (people) and whether they consider the odor to be objectionable. Odors are typically identified by nuisance complaints to the local air districts. Should poor maintenance create objectionable odors affecting a substantial number of people, the appropriate local air district could require the facility to mitigate the problem (for example by requiring that carcasses be buried or otherwise treated or removed from the facility) or stop operations. This impact is therefore considered to be less than significant with appropriate mitigation.

5.5 BIOLOGICAL RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Dept. of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Dept. of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?	☐	☒	☐	☐

5.5.1 Environmental Setting

California's marine aquaculture projects are located primarily in nearshore and intertidal coastal waters, as well as some inland settings adjacent to coastal streams. These coastal regions exhibit some of the richest biological diversity found in the United States, supporting thousands of flora and fauna species. In addition to marine aquaculture, a variety of other industries, including fishing, biotechnology, tourism and recreation, depend on the maintenance and enhancement of California's ocean and coastal habitats and living resources (OCEAN 1999).

5.5.1.1 Nearshore Coastal Waters

California's nearshore waters provide a rich and varied habitat for a diversity of marine

life. Vast numbers of algae, invertebrates, fish, seabirds, and mammals inhabit these shallow waters, which overlie a gently sloping region called the continental shelf. Where the shelf drops off to the deep sea floor, the open ocean begins. In contrast to the especially rich nearshore waters, the open ocean is much less fertile, gradually becoming less productive farther from shore. The fertility of nearshore waters depends upon patterns of oceanic circulation that supply the nutrients necessary to support life (CERES 1999).

Phytoplankton, the basis of almost all ocean food webs, thrives under normal nearshore summer conditions. Nutrient rich waters, combined with long sunlight days, causes the phytoplankton to "bloom." The resulting abundance of phytoplankton causes herbivorous and carnivorous zooplankton populations to expand. Common members of the zooplankton communities include protozoans, jellyfish, copepods, krill, mollusk larvae, and arthropod larvae. These zooplankton provide food for fish which are in turn eaten by birds and mammals.

In addition to phytoplankton-supported communities, lush growths of macro algae flourish in California's nearshore waters. The kelp forest is a diverse and complex community that occurs along much of the California coast. Kelp forests are composed of dense stands of large brown algae, predominately giant kelp, with an understory of various red and brown algae. Giant kelp is one of the fastest growing plants known. Growing an average of 10+ inches a day in spring, a frond of kelp may eventually reach a height of over 250 feet. Kelp forests provide food and shelter for an array of organisms invertebrates, anemones, abalones, fish, sea otters, and harbor seals.

The upwelling process that occurs in nearshore waters does not occur in the open ocean off the California coast. As a result, the vast open ocean is less abundant. Because food is less abundant here, pelagic fish must be able to travel great distances to find prey. Plankton-feeding fish that range from nearshore waters into the open ocean include Pacific herring and northern anchovy; predators include species of marlin, tuna, mackerel, and salmon, as well as squid. Many whales and porpoises also feed in the open ocean.

5.5.1.2 Intertidal Zone

The intertidal zone is the strip of shoreline that lies between the high and low tide marks and is regularly covered and uncovered by the advance and retreat of the tides. Intertidal communities occur on sandy beaches, in bays and estuaries, on wharf pilings, and on rocky shorelines. Three factors--substrate, wave shock, and exposure to drying--are important in determining the types of organisms found in a given intertidal community. Soft substrates, such as sandy beaches and mudflats, support an abundance of burrowing animals, whereas sessile, or attached, organisms are more typical of rocky shores. Areas that experience tremendous wave action allow only the most tenacious organisms to survive, while areas that receive considerably less wave shock support a variety of more delicate forms. However, the ability to withstand the desiccation and overheating while exposed to air by low tides may be the most important factor in determining where marine organisms occur in the intertidal zone. The extent to which an organism is exposed to air is largely determined by its vertical position in the intertidal region, and the pattern of the tides (CERES 1999).

Estuaries are formed in the intertidal zone where freshwater streams meet the sea, and

contain variably brackish water. Salt marshes develop along the shores of protected estuarine bays and river mouths, as well as in more marine-dominated bays and lagoons. These salt marshes and their associated tidal channels and mudflats fall within the classification of coastal wetlands.

Coastal wetlands are home to a variety of animals. Numerous fish species, including California killifish, bay goby, striped bass, topsmelt, and starry flounder are residents of coastal wetlands and depend upon them for reproduction. Subtidal eelgrass beds shelter larval and juvenile fish, as well as many species of invertebrates. Salt marshes are home to insects such as the salt marsh water boatman, wandering skipper, and numerous species of beetles and flies, which graze on leaves and seeds, help to pollinate the wetland flowers, and prey upon a variety of small animals. Clapper rails build platform nests in the low marsh, whereas Belding's savannah sparrows nest in and feed on the pickleweed of the higher marsh. Salt marsh mammals include shrews, harvest mice, and other rodents; harbor seals haul out on pickleweed and saltgrass in south San Francisco Bay.

Although relatively few bird species are year-round residents of coastal wetlands, many species temporarily inhabit salt marshes during their annual migrations. Coastal California is part of the Pacific Flyway, one of the four principal bird migration routes in North America. During the spring and fall months, coastal wetlands support flocks of waterfowl such as brant, pintails, mallard, and canvasbacks, and shorebirds such as sandpipers, curlews, willets, and godwits, which stop here to rest, feed, and in some cases overwinter.

5.5.1.3 Coastal Streams

California's coastal streams and rivers flow through the canyons and valleys of coastal mountains, linking forest, chaparral, scrubland, grassland, and marsh. Riparian woodlands develop along stream banks and floodplains, and coastal wetlands and estuaries form where the rivers enter the sea. Rivers transport nutrients, sediments, and oxygen through the watershed, and life flourishes in their path (CERES 1999).

Streams and the surrounding riparian woodlands support numerous animal species, including frogs, salamanders, snakes, muskrats, beavers, and river otters. Spruces, maples, cottonwoods, alders, and willows grow along the stream banks and attract large numbers of resident and migratory birds. An entangling understory of shrubs, flowering plants, and vines provides sites for nesting, shelter and shade for many animals. Algae and mosses proliferate in the water and on rocks. Leaves swept into the current decompose, adding nutrients and organic matter. Insects thrive here and in turn provide an abundant food source for invertebrates, fish, and birds. Anadromous fish such as salmon and steelhead migrate from the sea to fresh water to spawn and depend on well-oxygenated streams and gravelly streambeds and spawning sites.

5.5.2 Regulatory Framework

A number of State, Federal and local regulations determine the extent that development can impact biological resources of the State. The regulations most applicable to the coastal environment and its relevant biological resources are summarized below.

California Fish and Game Code. Numerous sections of the Fish and Game Code provide authority to the Commission, and in certain cases to the Department, for

protection of the State's fisheries and wildlife. The Commission delegates additional authority to the Department through Sections of Title 14, CCR. Through application of regulations that apply to all facilities required to obtain an Aquaculture Registration, the Department provides review of numerous biological activities such as importation of species, use of exotic species, broodstock collection, disease control and predator control. In addition, Section 1600 (F&G Code) requires a project proponent to develop a Streambed Alteration Agreement with CDFG prior to conducting activities that would affect the bed, bank, channel, or associated vegetation of a designated river, stream or lake in the State of California.

Federal Endangered Species Act (Federal ESA). The Federal ESA is a means to conserve ecosystems upon which endangered and threatened species depend, provide species conservation programs, and achieve the purposes of international treaties. The "take" of species designated as threatened or endangered by National Marine Fisheries Service (NMFS) or U.S. Fish and Wildlife Service (USFWS) is prohibited under the ESA. "Take" can include harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in such conduct. To prevent take, Federal and State agencies and private interests are required to consult with NMFS or USFWS on actions that may affect threatened and endangered species.

California Endangered Species Act (California ESA). The California ESA exists to conserve, protect, restore, and enhance endangered or threatened species and their habitats. As in the Federal ESA, the California ESA prohibits the take of a species listed as threatened or endangered, including activities that hunt, pursue, catch, capture, kill, or attempt to hunt, pursue, catch, capture, or kill a listed species. The California ESA requires agencies and private interests to consult with CDFG prior to conducting activities potentially resulting in take of a listed species.

Clean Water Act. The Clean Water Act serves to protect and preserve the chemical, physical, and biological integrity of the nation's waters. Several agencies administer the act, including the USEPA, the COE, the State Water Resources Control Board (SWRCB) and its respective Regional Water Quality Control Boards (RWQCBs). Activities that result in the placement of fill material in waters of the U.S. or adjacent wetlands are subject to the jurisdiction of the COE, pursuant to Section 404 of the Clean Water Act, and require authorization prior to project implementation. Individual projects that may affect these jurisdictional waters and wetlands will be subject to permitting at that time.

California Coastal Act. Preservation of California's coastal areas is clearly defined in the California Coastal Act (Public Resources Code Sections 3000 et seq.) and is implemented at the local government level. Any person or public agency planning development within the coastal zone must obtain a Coastal Development Permit from either the Coastal Commission or the city or county having authority to issue coastal development permits. In general, the coastal zone extends three miles seaward to approximately 1,000 yards inland from mean high tide. Aquaculture is identified as a priority coastal-dependent use of oceanfront land (Public Resources Code Section 30222.5.) Policies of the California Coastal Act that have particular relevance to protection of marine resources are contained in Sections 30230, 30231, 30233(a), 30705(a), and 30706.

5.5.3 Environmental Impacts and Mitigation Strategies

Marine aquaculture facilities have the potential to impact surrounding biological resources, but with appropriate design and mitigation these facilities can be operated with no significant impacts. Areas of potential impact discussed in the following subsections include 1) sensitive habitat, 2) fish migration, 3) bird migration and habitat area, 4) predator species, 5) special status species, 6) introduction of exotic species, 7) disease transmission, 8) escapement, and 9) sustainability of fish meal.

5.5.3.1 Sensitive Habitats

Sensitive habitats are recognized as having special ecological significance in natural biological processes. Due to similarities in typical location and operational practices, there are three groupings of marine aquaculture methods that are likely to exhibit common concerns in sensitive habitat issues. The common issues for the three groupings are as follows:

- Bottom and Off-bottom Culture: The proposed siting of bottom and off-bottom culture facilities in the intertidal and shallow subtidal zones can overlap with the location of eelgrass, which provides important rearing and forage habitat for several species of fish and birds. Areas rich with diverse benthic organisms form another sensitive habitat commonly found at sites suitable for bottom and off-bottom culture. Changes in hydrodynamic conditions or high densities of culture organisms have the potential to cause sediment accumulation and high BOD demand that can impact benthic communities and eelgrass, even though there is no addition of artificial feed.
- Floating and Submerged Cages: These facilities typically are located in nearshore coastal waters in areas protected from severe wave action. The substrate in these areas commonly host assemblages of benthic organisms that can be potentially impacted by sediment accumulation of fecal material and excess feed. For submerged cage projects involving abalone culture, there may also be a concern of the indirect effects of kelp harvest to supply food to the cultured organisms.
- Land-based Tanks: Since these upland facilities are most often located adjacent to coastal streams or bays, there is potential that the site may contain designated wetlands or riparian habitat that could be impacted during facility construction or subsequent operations. Again, if the project involves abalone culture, there may also be a concern of the indirect effects of kelp harvest to supply food to the cultured organisms.

The following paragraphs provide a more detailed discussion of these sensitive habitats and the typical manner in which impacts are avoided or mitigated during the design and permitting stages of an individual aquaculture project.

5.5.3.1.1 Eelgrass

Eelgrass is a marine flowering plant that is most commonly found in quiet intertidal zones and shallow subtidal zones having a sandy or muddy substrate. It occupies the lowest or most marine portion of the intertidal zone, as it cannot tolerate a freshwater environment or having its roots exposed to air. The upper limit of eelgrass habitat generally occurs at an elevation about 1 foot above mean lower low water (MLLW),

while maximum production is said to occur at -1 foot MLLW (HBHRCD 1999). The lower limit of eelgrass growth has not been clearly defined, but one recent eelgrass survey assumed a lower limit in the vicinity of -3.8 feet MLLW (Crandall and Fong 2000). The lower limit of eelgrass is influenced by water clarity.

The tangle of roots and stems that is typical of eelgrass beds helps to stabilize the soft substrate as well as to trap debris and dissolved nutrients with each tidal cycle. Bacteria convert the detritus into food resources for microscopic algae, invertebrate larvae, and larger animals. The food web and protection of cover in eelgrass provides critical nursery grounds for a number of organisms, including salmon and herring. (And since several salmon species are currently included in Federal and California ESA listings, salmon habitat such as eelgrass is likely to receive special attention and protection.)

In the past, some bottom culture facilities conducted partial removal of eelgrass in order to make the beds more accessible to dredge equipment. With the current recognition of the value of eelgrass habitat, this activity is no longer allowed, and there are cases in which previously existing authorization to conduct such activity has been revoked at established facilities (HBHRCD 1999). The prohibition against cutting or disturbing eelgrass is specified in CCR Title 14, Section 165 (b)(4).

Debate exists as to whether intertidal bottom culture causes adverse impacts to eelgrass through the sediment formed by feces and pseudofeces of cultured organisms. It is argued that if sediment accumulates to the extent that it covers the eelgrass, it is also covering the cultured organisms which will subsequently suffocate and die. The potential impact to eelgrass is therefore a self-limiting system (MSATS 2000a). Biodeposition from mussels has been shown to promote seagrass growth through increased nutrient enrichment, increased habitat structure, and an associated increase in biodiversity due to sediment enrichment and benthic community change (Peterson and Heck 2001).

The proposed aquaculture development of any site waterward of mean high tide requires obtaining an aquaculture registration from the Department of Fish and Game and a Coastal Development Permit according to requirements of the California Coastal Commision. Both agencies exercise authority to ensure there will be no significant disruption of eelgrass habitat. The following mitigation measures have been used in past projects to avoid or minimize impacts to eelgrass:

- Delisting of previously-approved State lease options when the area was found to contain eelgrass beds (pers. comm. T. Moore, CDFG, 10/17/00).
- Avoidance, to the maximum extent feasible, of locating any operations within areas containing eelgrass (HBHRCD 1999).
- When operating within areas containing eelgrass, it shall be a condition of operations to comply with CCR Title 14, Section 165 (b)(4) so that no eelgrass is cut or distrurbed (HBHRCD 1999).
- Cooperation and/or funding of research evaluating the effect of culture operations on eelgrass, including effects on associated biota and uses such as juvenile salmon rearing or shorebird foraging (HBHRCD 1999). If the research indicates a significant adverse affect on a resource, then the project subsequently may be required to modify its operations to reduce the impact.

5.5.3.1.2 Benthic Communities

Benthic communities are comprised of bottom-dwelling organisms including plants, invertebrates, and vertebrate animals that inhabit the bed of a water body. The species present in benthic communities are often characterized by the predominant size or type of substrate along with the hydrodynamic condition. For example, the typical organisms that inhabit a silty substrate in still waters (pelephilic benthos) will differ from those that inhabit a silty substrate in flowing waters (pelorheophilic benthos). The diversity and abundance of individual species within a benthic community can serve as indicators of the health and proper functioning of an aquatic ecosystem. As such, a general goal in minimizing environmental impact to aquatic ecosystems can be achieved by minimizing changes to the ambient conditions of benthic communities.

There is general consensus that accumulation of sediment can cause deleterious changes to benthic organisms living in the substrate. There is likely to be a drop in dissolved oxygen (DO) caused either by direct smothering or through increased respiration of bacteria that process organic sediments. The lower DO conditions have the potential to reduce the number of benthic organisms that can survive in the area, or there may be a transition to other benthic species more suited to the new conditions. Benthic community changes could in turn lead to changes in the fish and bird communities that feed on the organisms (CCC 1999).

Changes in hydrodynamics caused by bottom culture dikes or off-bottom culture structures can slow the velocity of water through a culture area and lead to increased deposition rates of suspended sediment (Pillay 1992). Conversely, it has been argued that the addition of support structures results in increased water velocity through the remaining open area of the culture area, and hence off-bottom culture activities can promote increased flushing of sediment (Newell 1999). In either case, it should be emphasized that no supplemental feed is provided with bottom or off-bottom bivalve shellfish culture methods, and any sediment originates as natural food and suspended solids carried into the area by currents.

Limited data available on the effects of dense clam culture indicate a slight increase in the amount of fine sediment in the vicinity of the culture plots, but there may or may not be a change in the species or abundance of benthic organisms. There is also evidence that the netting used for bottom culture predator protection may cause fine sediment accumulation by serving as a substrate for increased benthic algae production, which in turn increases sedimentation (MSATS 2000a).

Studies have shown that while the abundance of benthic organisms may decrease immediately under an area of off-bottom culture, there can be an increase in epifauna abundance that results from growth on facility structures. The overall result may be an increase in food available to fish and birds (MSATS 2000a). Research is currently underway in Arcata Bay to examine impacts of bottom and off-bottom culture on benthic infauna and epifauna (HBHRCD 1999). Results may provide guidance for the siting of future projects using bottom and off-bottom culture.

Projects utilizing floating and submerged cages involve the addition of feed to the cage units, and the deposition of uneaten feed and feces creates a potential for sediment accumulation on the bed beneath and surrounding the cages. From 1987 until 1996, all salmon net-pen projects in Washington State were required to monitor sediment chemistry, water chemistry, and benthic community characteristics (Nash 2001).

Analysis of this extensive database indicated several generalities regarding benthic impacts, including:

- **Sediment grain size and water depth are the primary factors determining the structure of an undisturbed infaunal community.**
- **In undisturbed reference areas, the total organic carbon (TOC) level in sediments was strongly correlated to the proportion of silt and clay fines in the sediment.**
- The redox potential and health of the infaunal community associated with a particular sediment grain size were well correlated with measured TOC levels. **This allows TOC to be used as a screening tool to evaluate benthic health indirectly.** In comparison to direct analysis of the infaunal community, the TOC screening tool has the advantage of being fast and less costly.
- Net-pen **projects located in well-flushed areas** (having currents greater than 1.7 feet per second) **frequently exhibited increased abundance and taxa richness of infaunal communities, even at high levels of salmon production.**
- Net-pen **projects located in poorly flushed areas** (having currents less than 0.3 feet per second) **often exhibited significant increases in sediment TOC, even when located in deep water.** At the same time, the adverse impacts were generally restricted to an area within 50 to 75 feet of the farm perimeter. Furthermore, it was shown that farm management practices were influential in reducing adverse effects.
- **Recovery of the benthos occurred naturally during fallow periods or following cessation of farm activities.** It was common to observe an initial three month period of rapid increase in abundance and species diversity, followed by a 3 to 25 month period of more gradual recovery.

The proposed development of any site waterward of mean high tide will require obtaining a Coastal Development Permit in accordance with the regulations of the California Coastal Commission. Furthermore, any proposed aquaculture development requires an approved aquaculture registration from the Department of Fish and Game. Both agencies exercise authority to ensure there will be no significant disruption of sensitive benthic communities. The following mitigation measures could be used to avoid or minimize impacts to benthic communities:

- Establishment of a Sediment Impact Zone (SIZ) and associated TOC trigger points that would be used to monitor acceptable sedimentation levels. The limits of the SIZ would ideally reflect the biological productivity of the site's benthos and the presence of adjacent valuable resources. The TOC trigger points would be appropriate for the type of sediment at the site. Existing monitoring programs in Washington use a biennial monitoring schedule, with additional sampling required if measured TOC levels exceed the trigger point (Nash 2001).
- Consideration of the site-specific conditions for average current, water depth, and sediment type when assessing the appropriate production level or density of organisms for an individual project (Newell and Shumway 1993, Nash 2001). Examples of guidelines for siting and production level are discussed further in Section 5.9.3.2 with regards to waste discharge.

5.5.3.1.3 Kelp Beds

The culture of abalone utilizes kelp as the feed source for the organisms. Most California abalone farms conduct their own kelp harvesting operations, though some establish contracts with commercial kelp harvesters to have kelp delivered to the facility two or three times a week. Estimates of the amount of kelp needed for the grow-out life of abalone (from seedling to market size) are 3.0 to 4.7 pounds of kelp per abalone (CCC 1999).

The demand for kelp in aquaculture operations remains relatively constant through the year. However, due to factors such as storms, the abundance of kelp has significant seasonal variation. CDFG, the lead agency responsible for managing the commercial harvest of kelp, has purposely avoided fixed standards for kelp harvest because kelp production is highly variable. Instead, aerial surveys are used to designate which kelp beds may be harvested, with a scheduled review every 5 years contingent on funding availability. In addition, regulations place limitations on the method of harvest, prohibiting kelp plants from being cut any deeper than four feet below the surface. This method provides protection for giant kelp, but it does not prevent bull kelp from being killed by harvest (CCC 1999). Harvesting of bull kelp is governed by regulations specific to that species.

In a recent review of four permits for abalone facilities in the Monterey Bay region, the CDFG concluded that these projects would not cause significant adverse additional impacts to kelp resource based on the following (CCC 1999):

- The current annual statewide harvest of kelp is over 100,000 tons per year. Any additional harvest for new abalone projects would be a very slight increase, on the order of 0.5 percent or less.
- The current kelp management program provides protection for giant kelp that will not harm the bed in the long term.
- The majority of bull kelp beds are protected by "lease" or "closed" designations that protect them from heavy harvest.

5.5.3.1.4 Wetlands and Riparian Habitat

Land-based aquaculture facilities may contain areas within their property boundaries that are designated wetlands or riparian habitat. The placement of fill material within wetland boundaries has the potential to alter the water regime and subsequently destroy the wetland. Projects that result in the removal or disturbance of riparian habitat can have substantial erosion impacts on the adjacent aquatic resources.

The most effective approach in avoiding wetlands issues is to avoid any development in potential wetlands areas. Local governmental agencies, assisted by the California Wetlands Information System maintained by CDFG, can assist a project proponent in assessing the general risk as to whether a specific parcel contains designated wetlands or riparian habitat. When it is unknown if these habitats occur on the site, and the project has the potential to affect natural vegetation, then CDFG generally recommends that the project proponent conduct a wetland delineation and/or botanical field survey (CDFG 2000).

The extent of a wetland is determined by examining the presence of three parameters:

hydrophitic vegetation, hydric soils, and wetland hydrology. Under normal circumstances, all three parameters must be satisfied for an area to be considered a jurisdictional wetland under Section 404 of the federal Clean Water Act. Only one parameter must be present to qualify as a wetland under the criteria of CDFG.

Hydrophitic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present. The vegetation occurring in a wetland may consist of more than one plant community (wetland plant communities may contain plant species that are Obligate (OBL), Facultative Wetland (FACW), Facultative (FAC), Facultative Upland (FACU), Upland (UPL), No Indicator (NI), and/or Not Listed (NL)).

Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (Experimental Laboratory 1987).

Wetland hydrology is defined as all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively.

- landscape position and surface topography (e.g. position of the site relative to an upslope water source, location within a distinct wetland drainage pattern, or concave surface topography);
- inundation or saturation for a long duration (either inferred based on field indicators or observed during field surveys); and
- residual evidence of ponding or flooding (e.g. scour marks, sediment deposits, algal matting, and drift lines).

If it is determined there are jurisdictional wetlands on the site, the project proponent can mitigate potential impacts by avoiding any development within the wetland boundary. If it is not possible to avoid the wetland altogether, it may be possible to adjust component locations to reduce and minimize the area of disturbed wetland. Any individual project proposing the placement of fill in wetlands or below the ordinary high water mark of a riparian zone must obtain an approved Form 4345, administered by the COE through Section 404 of the Clean Water Act. If these areas also fall within a defined coastal zone they will require a Coastal Development Permit. For any work planned within a streambed, a Streambed Alteration Agreement must be obtained from CDFG in accordance with Section 1600 of the Fish and Game Code. The total area of disturbed wetland is a critical parameter in establishing subsequent permit conditions.

Current policy of both the federal and state governments calls for "no net loss of wetlands". Methods of wetlands mitigation that have been accepted by COE and CDFG for other projects include the following.

- For every acre of wetland area affected, an equal area of wetland will be constructed on site.
- For every acre of vernal pool habitat directly or indirectly affected, at least two vernal pool credits will be dedicated with a USFWS-approved ecosystem

preservation bank.

- For every acre of vernal pool habitat directly or indirectly affected, at least one vernal pool creation credit will be dedicated within a USFWS-approved habitat mitigation bank.
- For every acre of seasonal swale directly affected, one acre of seasonal swale credit will be purchased from a USFWS-approved habitat mitigation bank.

Additional mitigation measures can be incorporated into individual projects to reduce potential construction activity impacts to ***less than significant with mitigation.*** Common mitigation measures include the following:

- During construction, protective silt fences shall be placed 100 feet from any waterway's edge, including wetlands and vernal pools. No construction activity or equipment storage will be allowed within this buffer without prior approval.
- Revegetation of disturbed riparian areas shall be conducted as soon as possible following completion of construction activities.

5.5.3.2 Fish Migration and Habitat

Marine aquaculture projects may require structures to be placed in or on top of the water, such as off-bottom support structures, floating or submerged cages, boat docks and ramps, and pump intake structures. The structures occupy space and will displace a direct line movement of fish. However, if the structures are small or permeable, they should cause no delay to migration. At the same time, these structures often create new habitat for aquatic organisms. Algae, invertebrates, crabs and many other species will grow on these structures. This in turn becomes a food source for fish and diving birds. The placement of structures can have a beneficial impact of creating new fish habitat. Research currently is being discussed to evaluate the effects of aquaculture structures on juvenile salmonids in Humboldt Bay (HBHRCD 1999).

The construction of in-water structures may cause a temporary disturbance of soils that results in a short-term increase in turbidity. Construction vehicles have the potential to damage benthic organisms. The significance of these impacts may vary by season. For example, use of areas for spawning, egg incubation and nursery habitat is likely to be confined to certain periods of the year, dependent on the species in question.

The placement of any structures in coastal waters will require an approved Coastal Development Permit issued by the California Coastal Commission, and Form 4345 issued by the COE. The same is required for any construction activities occurring in coastal waters. The approval of these permits is contingent on a determination that there will be no significant adverse affects to fish resources, to Essential Fish Habitat identified by fishery management plans under the federal Magnuson-Stevens Fishery Conservation and Management Act, or to Critical Habitat identified under the federal Endangered Species Act. In some cases, the proposed project may be required to implement appropriate mitigation to reduce the potential impacts to levels that are less than significant.

5.5.3.3 Bird Migration and Habitat

Structures used for off-bottom culture, floating cages and submerged cages may reduce

the reach of open water area used by certain waterfowl and marine birds. This may affect certain species requiring long distances for take-off or landing on the water. The use of tidal lands for bottom and off-bottom culture may have an impact on the value of these areas as foraging habitat for shorebirds. A detailed discussion on potential effects of aquaculture operations on shorebirds and other aquatic and marine birds is presented in HBHRCD 1999.

The placement of any structures in coastal waters will require an approved Coastal Development Permit issued by the California Coastal Commission, and Form 4345 issued by the COE. The approval of these permits is contingent on a determination that there will be no significant adverse effects to shorebirds and other aquatic and marine birds, or that there will be appropriate mitigation to reduce the potential impacts to levels that are less than significant.

5.5.3.4 Predator Species

The presence of captive and concentrated organisms at aquaculture facilities usually attracts predators of the cultured species. Common predatory species for marine aquaculture projects include birds (herons, kingfishers, cormorants, mergansers, gulls, osprey), marine mammals (harbor seals, California sea lions, river otter) and fish and crustaceans (bat rays, crabs). Attempts by these predators to capture the cultured organisms can damage facility equipment and can injure or kill the prey. Predation can result in significant and even total losses of product.

Measures are sometimes used by aquaculturists to reduce predation. The following is a list of common measures:

- Anti-predator nets are used at floating cage facilities to prevent birds and marine mammals from reaching the interior pen below the water. Netting is suspended above the cage from walkway railings or cage sidewalls to enclose the cage surface and prevent bird access. Subsurface anti-predator nets are typically suspended from walkways or outriggers to create a total enclosure 3 to 9 feet out from the growing pen. Weights are attached to subsurface predator nets to keep them taut and reduce movement toward the growing pen.
- Bottom netting has been used at bottom culture facilities to reduce predation by crabs.
- Fences have been used to exclude bat rays from bottom culture grounds. Research currently is being conducted to evaluate the potential effects these fences may have on tidal dynamics, sedimentation, and other species (HBHRCD 1999).
- Acoustic harassment devices (AHDs) create loud noises to scare birds and marine mammals away. The effectiveness of these devices often diminish over time as the animals become accustomed to the noise. As a result, AHDs are often used only on a short-term and intermittent basis.
- In severe cases, a depredation permit may be issued to allow lethal control measures. The permits are issued by CDFG, USFWS or NMFS depending on the species. Permit approval requires thorough justification of the need, and conclusive evidence that there will be no significant adverse effect to the population of concern. The permits contain very restrictive terms regarding allowed numbers of take.

The method of predator control appropriate for an individual project will be dependent on the species produced, type of rearing unit used, site location, and the abundance of the predator population. There is a strong performance record of predator control design to aid in selection of the most effective control measures for an individual site. Consequently appropriate mitigation can reduce environmental impacts of predator control to less than significant.

5.5.3.5 Special Status Species

Aquaculture operations or construction activities have potential to effect species protected under the Federal ESA and the California ESA. A determination of the presence or absence of specific special status species is not possible in a Program EIR and requires review in the context of a site-specific project application. Special status species whose life cycle characteristics are most likely to overlap with the general habitat requirements of marine aquaculture projects include:

- salmonids
- tidewater goby
- marbled murrelet
- brown pelican
- osprey
- terns

Twenty-six population groups of salmonids are currently listed as threatened or endangered under the Federal ESA. These groups are defined as "evolutionary significant units" (ESUs), with each being a distinctive population of salmon or steelhead that is uniquely adapted to a particular area or environment. The 10 listed ESUs that occur in California are:

- Northern California steelhead
- Central California Coastal steelhead,
- South-Central California Coastal steelhead
- California Central Valley steelhead
- Southern California steelhead
- Sacramento River Winter-run chinook
- Central Valley Spring-run chinook
- California Coastal chinook
- Southern Oregon/Northern California Coastal coho
- Central California coho

The geographic range of each ESU has been defined by the National Marine Fisheries Service (NMFS) and includes both the freshwater and marine habitat utilized by these species. Under Section 7 of the ESA, any activity involving Federal funding, permitting or implementation was required to assure that no listed species would be killed or injured without specific authorization. In June 2000, NMFS adopted new rules under Section 4(d) of the ESA , expanding the requirement for protection of these fish to private and State actions as well as Federal actions. These rules are commonly referred to as "the 4(d) rules". Additionally, the 4(d) rules are working towards simplifying the process of project approval by encouraging the development of local regulations assuring "salmon-safe" development. In this way, compliance with local regulations will also mean compliance with the ESA. During the Preliminary Review phase of an

individual project application, the local agency will identify whether a proposed site is located within the boundaries of a specific ESU, and it will also provide information regarding the status of local ordinances and plans that pertain to the 4(d) rules.

If the proposed location of an individual marine aquaculture project indicates a disturbance to areas that potentially contain salmonid habitat or the habitat of any other special status species, then it is likely that the project proponent will be requested to conduct surveys to identify rare, threatened and endangered plants and animals during the Preliminary Review phase of an individual project application. The authority for requiring the surveys could come through a relevant Natural Community Conservation Plan or Habitat Conservation Plan, through the General Plan of the local agency, or through the permit requirements of the California Coastal Commission, where applicable.

The results of species surveys may trigger subsequent permit actions through the NMFS, USFWS, or CDFG, depending on the species identified. Project approval will require a determination of no significant adverse effects on special status species. This determination typically involves analysis of potential impacts to sensitive habitats, fish migration, and other biological parameters that are addressed in other subsections within the Biological Resources category. As a result, there is no direct discussion of possible mitigation measures to reduce impact on special status species, but it is instead addressed through the separate analyses of other parameters that contribute to a healthy ecosystem function. A project cannot be approved unless potential impacts on special status species are less than significant as required for compliance with ESA policy.

5.5.3.6 Introduction of Exotic Species

The Department of Fish and Game defines an exotic species as any animal or plant that is not native to California or which does not presently exist as a viable population in a wild condition in the State. The Department acknowledges that some formerly exotic species have become established in California by the aid of humans and classifies these organisms as previously established non-native species. Non-native species present an environmental concern because there may be no natural predators to the species, allowing the species to dominate competition for food and habitat resources, thereby reducing available resources for native species.

Exotic species issues are regulated within the California aquaculture industry by the Department of Fish and Game (CDFG). Species to be cultivated are identified in the Aquaculture Registration submitted annually by facility operators. Any registration that includes a proposal to import live exotic species will trigger the need for a special permit by the Fish and Game Commission. Permit approval requires acceptance by CDFG that potential effects of the proposed introduction will not have unacceptable negative impacts on native species, agriculture interests and public safety.

Exotic species issues are also regulated through two Federal agencies: the U.S. Fish and Wildlife Servide (USFWS) and the Animal and Plant Health Inspection Service within the U.S. Department of Agriculture (APHIS). The USFWS has responsibility for regulating importation of injurious fish and wildlife into the U.S. under the Lacey Act. APHIS has a broad mandate relating to the importation and interstate movement of exotic species under the Federal Plant Pest Act and the Plant Quarantine Act. The

primary concern of APHIS is the protection of agricultural crops. Compliance with these Federal regulations is assured under the special permit noted above approved by the Fish and Game Commission.

A past incident occurred in which the introduction of an exotic species, the sabellid worm, was accidentally introduced to California when infested abalone were imported into an aquaculture facility. A recent ruling (CCC 1999) provides a thorough discussion on the background of this event and the CDFG response in sampling, eradicating the worms from existing facilities, and implementing programs for preventing new infestations.

The CDFG has already established measures that have been implemented to minimize the risk of infestation of natural abalone populations which include:

- All stock for new projects must be obtained from a facility that has been certified by the CDFG as sabellid-free, or from a facility that has applied for sabellid-free certification and that uses wild broodstock, each of which have been inspected by CDFG and found to be free of sabellids.
- Facilities shall conduct abalone transfer and inspection procedures as directed by CDFG.
- Should a sabellid-infested animal be discovered, the facility shall immediately remove the cage or container in which the animal was found.
- Facilities shall not discharge abalone shells into the marine environment.

In-water facilities should be anchored firmly to ensure that grow-out structures do not break free.

Other occurrences of introduced pests associated with non-native aquaculture species have been reported in Europe and North America. The Pacific oyster (*Crassostrea gigas*) was first brought from Japan and planted into waters of Washington State in the early 1920s, and it is attributed with being the source of introductions of the Japanese oyster drill (*Ceratostoma inornatum),* a flatworm (*Pseudostylochus ostreophagus*), the Japanese littleneck or Manila clam (*Venerupis philippinarum)* and the woodborer (*Limnoria tripunctata)* (Quayle 1988). Today's requirements for importation and interstate transport of shellfish involve certification by Federal and/or State inspectors. As a consequence, the risk of introductions of exotic species is reduced to less than significant.

5.5.3.7 Disease Transmission

Two documented examples of "disease transmission" have occurred between cultured and wild Atlantic salmon: one involving a freshwater parasite in Norway and a second involving the IHN virus in Japan (Nash 2001). However, in both of these cases, the disease was caused by exotic pathogens accidentally imported with infected Atlantic salmon stocks, to which the wild populations had little or no immunity. An analogous incident occurred in California when an exotic parasite, the sabellid worm, was accidentally introduced to California waters by way of infested abalone imported into an aquaculture facility. Though the issue of exotic pathogens shares many of the same concerns as disease transmission, the regulatory framework for protecting against introduction of new diseases is more appropriately addressed by the exotic species aspects of the issue, which is discussed in detail in Section 5.5.3.6. The remainder of this

subsection will address pathogens that are endemic to the natural aquatic ecosystem of California, and hence will focus on whether aquaculture has the potential to increase the incidence of disease that may occur naturally in the environment.

Diseases are an inherent part of the natural aquatic ecosystem, and yet there is an impression that disease originates in the culture environment (Hedrick 2001). In the aquatic environment, cultured aquatic species can act as reservoirs of pathogens to wild species, and vice versa (WDF 1990). Most disease reports for fish operations refer to intensive culture conditions that may enhance the impact of the disease. Wild populations may not become affected from exposure to these pathogens due to more favorable environmental conditions, such as better water quality or lower population densities (Pillay 1992). The technical literature indicates that there is a risk of transmission of pathogens from cultured species to wild species, but that risk is likely not a significant problem (WDF 1990; Journal of Aquatic Animal Health 1998). In one of the premier trout streams in Washington, all of the stream flow consists of effluent from an Atlantic salmon hatchery. There have been no reports of diseased trout in this stream (Nash 2001).

The pathogen, or causative agent of disease, is the focus of surveillance or control programs (Hedrick 2001). Focus upon the pathogen occurs because they are discrete agents or organisms that are readily identifiable with various laboratory techniques. Regulatory agencies will be cautious and conservative in the management of pathogens (Hedrick 2001). Regulatory actions can include limits on movements of live aquatic species or products, or orders for stock destruction and or facility disinfection (Hedrick 2001).

Pathogens are not uniformly distributed throughout the aquatic environment (Hedrick 1997). Variations in the distribution of pathogens can occur on a local to global level. Methods to prevent the spread of pathogen are implemented by State and Federal resources agencies. Agencies apply restrictions to species or product movement based on a list on notifiable diseases. These diseases have been identified by the regulatory agencies to be of greatest concern due to the level of risk to the resource if they were disseminated throughout the aquatic environment.

To control the spread of pathogens, management zones are typically defined by the regulating agencies. These zones can be based upon geographical regions or watershed locations (Hedrick 1997). Identification of endemic pathogens to each zone is accomplished by surveillance of the aquatic species occurring within each zone. This includes both aquaculture species and wild occurring species. Aquaculture species are subject to inspection and certification at various levels in order to meet the transfer requirements of the receiving state or country. CDFG has recently implemented salmonid fish and egg movement restrictions to within drainages. The fish pathogen management goal of CDFG is that of no expansion of the range of the pathogen shall occur from fish or egg movements (Dr. Bill Cox, CDFG, pers. comm. 4/13/00). Eggs or fish that test positive for a pathogen are not allowed to be moved within a drainage if that movement would expand the range of the pathogen. Fish or organisms with clinical disease are not allowed to be moved (Dr. Bill Cox, CDFG, pers. comm. 4/13/00). As an example, to control the spread of Withering Syndrome of abalone CDFG has imposed seed stock transfer restrictions and inspection requirements from endemic areas (CCC 1999).

5.5.3.8 Escapement

Escapement of organisms from an aquaculture facility has the potential to establish a population in the wild that would compete for food sources and habitat normally used by native populations. If the cultured organism also occurs naturally in the area, there is the additional concern that the cultured organisms could interbreed and cause genetic impacts to the local population.

The potential significance of impacts from escapement depends on three variables:

1) that significant numbers of organisms escape from the facility,
2) the ability of the fugitive organisms to outcompete native populations, and
3) the ability of the fugitive organisms to interbreed with native populations.

In West Coast invertebrate aquaculture operations the Pacific, Kumamoto, Eastern and European flat oysters and the Manila clam are all non-indigenous species and do not interact genetically with native stocks (MSATS 2000a). Two West Coast species of concern for maintaining genetic integrity are the Geoduck and the Olympia oyster (MSATS 2000a). While the genetic identity of populations is being completed the industry is cooperating by only obtaining broodstock from the same regions where the outplanting is going to occur (MSATS 2000a).

Because bi-valves are broadcast spawners and have a prolonged free floating larval cycle, escapement that could result in genetic pollution has not been considered a problem (MSATS 2000a). The probability of escaped larva(ae) or seed survival will vary depending on the water temperature, appropriate habitat and presence of predators in the environment (MSATS 2000a). Without predator protection the probability of survival is very small (MSATS 2000a). In the grow-out phase, aquaculture crops can successfully condition and spawn, with the resultant larvae then settling to the bottom. This could be considered escapement (MSATS 2000a). The likelihood of this occurring is again dependant upon the required environmental conditions, habitat and predators (MSATS 2000a). Impacts to native populations could occur due to loss of habitat and competition for food resources.

The escapement of non-indigenous live feed utilized in shellfish aquaculture has been raised as a concern in at least one state, Rhode Island, during the facility permitting process. Some microalgal cultures utilized to feed shellfish can escape into receiving waters since filter feeders are not completely effective at removing the food from the culture water (MSATS 2000a). These strains of microalgae have been cultured under carefully controlled artificial conditions for tens of thousands of generations and succumb quickly to less than ideal conditions (MSATS 2000a). Decades of worldwide use of cultured non-indigenous microalgal strains in shellfish hatcheries has not resulted in any documented occurrence of an algal bloom or even a low level introduction in the receiving waters (MSATS 2000a).

For all aquaculture facilities, there is a strong economic incentive to minimize the loss of product. A mitigation measure used for some land-based tank facilities is to screen the discharge outfall, using a slot size to prevent escapement of the species of concern. Cage culture facilities may use a double row of nets to minimize escapement. Nonetheless, escapement of organisms from culture situations can occur due to enclosure/screening failures from weather related incidences or from predator damage.

Escapement levels have been estimated in the Atlantic salmon net-pen industries of

British Columbia and the Pacific Northwest. In the period between 1980 and 1995, there was a total estimated Atlantic salmon escapement of 1 million fish, or roughly 62,000 fish each year on average (Nash 2001). However, fewer than 20 adult Atlantic salmon were captured during a survey of all Washington river systems in 1997, and no naturally-spawned Atlantic salmon have been observed in Washington rivers to date (Nash 2001). In British Columbia, around 100 naturally-spawned juvenile Atlantic salmon were counted during a survey of the Tsitika River, yet it was also noted these fugitives made up approximately 1% of all salmonids in the river and presented no competition for food or rearing space (Nash 2001). These findings suggest that escaped Atlantic salmon are not surviving in adequate numbers to have an adverse affect on native species. There have been no reported genetic interactions between Atlantic salmon and Pacific salmonids in the Pacific Northwest. Even under controlled laboratory conditions, viable hybrids between Atlantic and Pacific salmon are difficult to produce (Nash 2001).

It is recognized that data regarding Atlantic salmon escapement in the Pacific Northwest cannot serve as a predictor of the response that other aquacultured species might exhibit if significant escapement occurs. However, it serves to illustrate the extent of monitoring that is typical regarding fisheries management issues. For escapees to cause a negative impact they would have to survive once they have escaped, be able to interbreed with native populations, or escape in sufficient numbers to outcompete native populations (WDF 1990). If the escapees are able to breed with native populations, extensive genetic impacts are likely limited and temporary without a constant infusion of numerous escaped fish into the wild population (WDF 1990). All of these issues are evaluated by CDFG during the review of site-specific applications for proposed aquaculture projects. Any concerns regarding potential impacts from escapement will be appropriately mitigated to assure that effects are less than significant.

5.5.3.9 Sustainability of Fish Meal

A variety of farmed animals including poultry, pigs and fish are raised on feed containing fishmeal and fish oil. Fishmeal is derived primarily from small, bony, oily fish such as anchovies, sardines and menhaden, commonly referred to as forage fish. There are limited outlets in which forage fish are desired as a human food, and roughly one-third of the global catch of forage fish is processed into fishmeal each year (Goldburg et al. 2001). The principal fisheries for forage fish occur in Peru and Chile.

Over the past 10 years, the average annual worldwide production of fish meal has been on the order of 6.5 million metric tons (Hardy 2000). In 1998, about 40 percent of the total fish meal production was further processed into fish feed. With the aquaculture industry growing rapidly, there is concern that an increased demand for fish feed and fish meal will lead to an increased exploitation of forage fish, which in turn could impact natural populations of fish, mammals and seabirds that rely on the forage fish for food (Goldburg and Triplett 1997, Goldburg et al. 2001).

Conditions of varying supply and demand for fishmeal have lead to price volatility in the world marketplace. An extreme example of this was seen in 1998, when an El Nino event resulted in drastically reduced landings in Peru and Chile and subsequently led to price increases approaching double the normal price (Hardy 2000). This price volatility has been a key factor driving the research focus of major fish feed producers over the past decade, to find alternative, vegetable-based sources of protein and oil that

can be obtained with greater predictability in yield, shorter transport distances, and greater price stability. Research and development of these new feed products includes confirmation that they provide the essential nutrients for optimal fish growth, and that they remain sufficiently palatable and digestible to ensure a cost-effective Feed Conversion Ratio (FCR). (The FCR is the ratio of the amount of feed used to produce a given weight of fish. A common goal in the fish feed industry is to strive for one pound of fish feed producing one pound of cultured fish.)

Nutritional requirements and feed conversion characteristics vary by fish species. Catfish, tilapia and carp, for example, are omnivorous fish that can digest and utilize vegetable-based protein much more effectively than carnivorous fish species such as salmon, trout and sea bream. The fish feed industry has responded to these differences by developing a variety of commercially available products that strive to achieve the most cost effective feed source for a given species. Standard fish feeds sold in the United States for catfish and tilapia utilize significant amounts of vegetable protein and vegetable oil, such that it takes only about 0.3 to 0.6 pounds of wild fish to produce one pound of catfish or tilapia, respectively (Goldburg et al. 2001). Salmon and trout feeds currently on the market are requiring about 1.5 pounds of wild fish to produce one pound of salmon or trout (J. Mann, EWOS Ltd., pers. comm. 11/12/02). Marine finfish and eels, reported to require more than four pounds of wild fish to produce one pound of product (Goldburg et al. 2001), are cultured to a very limited extent in California. The poor feed conversion implied in the values for marine finfish and eels suggests the use of a "wet feed", comprised of ground fish and/or animal byproducts and a small amount of vegetable binder. While still used in Japan and many developing countries, the use of wet feed in the United States was already being phased out of salmon and trout production by the late 1950s in favor of the semi-purified diet and the Oregon Moist Pellet, formulated for use in state and federal fish hatcheries (Hardy 2000). These initial feeds formed the basis of today's commercially-driven fish feed industry. The fish feed industry is continuing research and product development to reduce fishmeal utilization, both for greater price stability and in response to consumer demand for more sustainable products.

The world's major resources for fishmeal production have controls imposed on their utilization. Almost all the resources are subject to total catch limits, area catch limits, minimum mesh sizes, fleet capacity controls, closed areas, and seasonal bans. Some are also subject to minimum landing sizes. In Peru and Chile, the closed areas for anchovy and sardine are now enforced by satellite tracking (Barlow 2001). The magnitude and frequency of monitoring devoted to forage fish utilization is evidence that these resources will not be impacted at significant levels. As an example, recovery of stocks following the 1998 El Nino collapse was rapid in the South American fishmeal fishery, indicating that these sources are robust and sustainable at the present capture levels (Scottish Executive Central Research Unit 2002).

There are few consumers around the world that consume forage fish directly as part of their diets. How forage fish and fishmeal are used, whether for pet food, agriculture of pigs and chickens, or as an aquaculture feed ingredient is ultimately determined by the market place. When the supply of fishmeal becomes scarce, the cost increases, causing demand to decrease. The agricultural feed industry has made great gains reducing reliance on fishmeal in efforts to develop least cost feeds. Continued research and development of feeds using other protein sources should ensure that fishmeal is used

for its most highly valued purpose.

There are no known standards, policies or ordinances in California or in the federal government that control the use of fishmeal. Consequently, it is not feasible or appropriate to define a threshold of significance for fishmeal utilization by proposed aquaculture projects. No significant local environmental impacts will occur due to fishmeal utilization.

5.5.4 Summary Discussion of Thresholds of Significance and Mitigation Measures

The potential for a marine aquaculture facility to have a significant adverse effect on biological resources has been discussed in the preceding subsections from a programmatic basis, focusing on nine issues that most commonly arise with these types of projects. The specific extent to which these effects may occur, and the mitigation measures that will successfully reduce these effects to a level that is less than significant, will be dependent on site-specific characteristics. During review of an individual aquaculture project, the local agency and all responsible agencies will ensure these site-specific features comply with the relevant laws establishing their respective permit authority. Most notably, CDFG will review every application for an Aquaculture Registration to ensure construction and operation of the facility will not provide significant risk to fish and wildlife resources, and the Coastal Commission or the local agency will ensure adequate protection of marine resources. The following table reiterates the biological resource issues discussed in the preceding subsections, as well as those noted in the environmental checklist not requiring a more detailed discussion. The table also provides a general threshold of significance for each issue, and summarizes mitigation measures that, when necessary, can be applied on a case-by-case basis to reduce the biological impacts to levels that are less than significant.

Issue	Potential Threshold of Significance	Potential Mitigation Measures to Reduce Impact to Less than Significant
Sensitive habitat	Site contains eelgrass, benthic community, kelp bed, designated wetlands, riparian habitat, or other identified sensitive natural community; AND relevant responsible agency determines proposed project will cause significant adverse effect to the habitat.	• Avoid or minimize impact to sensitive habitat • Conduct operations so that no eelgrass is cut or disturbed • Establish an impact assessment zone and monitor relevant indicators of impact, and adjust production level as needed to stay within acceptable impact levels • Comply with current kelp management programs • Provide constructed wetlands • Dedicate credits to ecosystem preservation bank or habitat mitigation bank
Fish migration and habitat	Relevant responsible agency determines proposed in-water structures or construction activities will cause significant adverse effect to fish resources, Essential Fish Habitat, and/or Critical Habitat.	• Provide screens at water diversions to prevent fish entrainment • Conduct in-water construction during approved in-water work periods to avoid potential impact during migration season or other periods of biological sensitivity.

Issue	Potential Threshold of Significance	Potential Mitigation Measures to Reduce Impact to Less than Significant
Bird migration and habitat	Relevant responsible agency determines proposed project will cause significant adverse effect to forage value or area access by birds.	• Configure in-water structures to maintain some reaches of open water area for take-off or landing on water.
		(continued next page)
Predator species	Relevant responsible agency determines proposed project will attract such significant numbers of predators as to disrupt existing ecosystem balance.	• Provide anti-predator netting, bottom netting or fencing to prevent predator access • Use acoustic harassment devices (AHDs) o scare predators away • Obtain a depredation permit to allow lethal control measures, and comply with permit terms regarding allowed numbers of take
Special status species	Site contains lands defined as critical habitat for threatened or endangered salmonid species; or surveys identify on-site wetlands and/or rare, threatened and endangered plants and animals; AND relevant responsible agency determines proposed project will harass or harm listed species.	• Avoid or minimize impact to critical habitat, sensitive habitat, and wetlands • Insure compliance with other biological resource issues
Introduction of exotic species	Project proposes to import live species defined as "exotic" by CDFG or by the Animal and Plant Health Inspection Service within the U.S. Department of Agriculture (APHIS), or defined as "injurious" by USFWS.	• Provide measures to confine the exotic species sufficient to obtain approved permit from CDFG
Disease transmission	Project proposes culture of species with high risk of disseminating a notifiable disease (per CDFG determination).	• Develop CDFG-approved plan describing inspection and certification requirements for product transfer, and Best Management Practices for fish health monitoring at facility
Escapement of cultured species	Cultured species determined by CDFG/NMFS/USFWS to present high risk of escaping and surviving in large enough numbers to compete with native populations or cause genetic impacts through interbreeding.	• Provide physical barrier (such as effluent screens or second row of cage netting) to prevent escapement
Local biological resources, such as trees	Proposed project conflicts with local policies or ordinances protecting biological resources (such as a tree preservation policy or ordinance)	• Design facility to avoid or minimize impact to the subject local resource • Provide appropriate mitigation as specified by local agency
Approved Habitat Conservation Plan	Proposed project conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan	• Revise facility design to comply with the provisions of the plan • Provide appropriate mitigation as specified by the plan administrator

5.6 CULTURAL RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

5.6.1 Environmental Setting

5.6.1.1 Natural Setting

The California coastline constitutes approximately 1,000 miles of diverse microenvironments including sandy beaches, rocky shores, tidepools, river-mouth estuaries, bays, salt and freshwater lagoons, sea cliffs, and marshes. It is a region with an abundance of rich and varied resources derived from the diversity of the terrain and plant and animal communities. Each of the microenvironments supports a distinct complex of shellfish, mammals, fish, waterfowl and plant life. It was precisely the abundance and diversity of the littoral habitat that attracted early human settlement to the coastal region of California.

5.6.1.2 Prehistory

Archaeological evidence indicates that early Native Californians (~10,500-9000 B.C.; Paleo-Indian Period) did not settle in the coastal regions of California but rather chose the playas of interior southern California desert valleys and parts of interior northern California. Beginning in the Archaic Period (~900-2000 B.C.) coastal regions were settled but only in the San Francisco Bay Area, the Channel Islands and southern California. Settlements were typically clustered along the numerous small creeks and rivers and around bays and estuaries. The Pacific Period (2000 B. C. –1769 A.D.) exhibits extensive evidence for coastal occupation. Although settlements were predominantly located along the southern California coast and in the Bay Area, there were occupation pockets in the Pacific Northwest and the Monterey Bay region. It should be noted that prior to the Pacific Period, settlement types were mainly temporary campsites, which facilitated subsistence, by procurement of seasonal resources known as the "seasonal or annual round." In the Mid-to-Late Pacific Period, there was a decline of the annual round subsistence base. Instead, a trend towards developing more productive methods to harvest and store food led to a more sedentary lifestyle and more permanent settlements with substantial residential structures.

Perhaps the most distinctive archaeological sites to be found along California's coast are

the shell mounds. Comprised of huge mounds of discarded shells, these mounds are also known to contain artifactual material such as perforate charmstones, stone tools, and obsidian implements. Human burials and cremations numbering in the hundreds have also been recovered. Shell mounds vary in size; some of the largest measure approximately 30 feet in depth.

The arrival of the Spanish in the coastal regions of California, such as San Diego and the San Francisco Bay Area led to the rapid and major reduction in Native California populations. Diseases, declining birth rates, and the effects of the mission system served to largely eradicate aboriginal lifeways.

5.6.1.3 Historic Background

The era of exploration brought numerous Spanish explorers (primarily along the coast) beginning in 1542 when Juan Rodriguez Cabrillo landed in San Diego, claiming the land for the Spanish crown. Following the era of exploration, four Spanish institutions were employed to settle Alta California: missions, presidios, pueblos and ranchos. Of these the mission system was the most successful, with missions typically located in coastal regions from San Francisco south to San Diego. Following the secularization of the missions in 1833, land grants of inland and coastal lands increased substantially. In 1848, California became a United States territory as a result of the Treaty of Guadalupe Hidalgo, which ended the war with Mexico. The Gold Rush of 1849 brought a massive influx of immigrants to California from all parts of the world and began the move towards urbanization. Coastal ports such as San Francisco, San Diego and Los Angeles became centers for urbanization as goods for the burgeoning California population were shipped to these ports from all over the world. Following the decline of the gold rush, new industries developed in California including farming, logging, ranching, and transportation. Owing to the lack of overland transportation, water transport linked large and mid-level cities to the coast and major river systems. The development of a water transportation system capable of moving large volumes of freight led in turn to the establishment of new industries and communities in areas where none had previously existed. A prime example was the launching of the redwood logging industry along California's northern coast, which served to establish the town of Eureka as a port, a mill town and a regional center. Other industries typically located in coastal regions include fur trading outposts, logging camps, fisheries, and sand mining operations.

During World War II, large portions of the coastal region were transformed into defense facilities with huge military and housing complexes. Following the war, the economic boom in California saw more industrial growth along the coast and in inland areas. Manufacturing centers, light industry, oil drilling, sand mining, and fishing operations of various types were located near major transportation centers such as Los Angeles, San Francisco, and Eureka. Although coastal development has been monitored since the enactment of the California Coastal Zone Conservation Act in 1972, the California coastal region remains a desirable area with significant growth potential.

5.6.1.4 Paleontological Resources

Paleontological resources are the fossilized remains of plants and animals. Fossils are unique, non-renewable resources that provide clues to the history of life on earth; as such, fossils have scientific value. Fossils are known to exist in various locations in

California's coastal regions.

5.6.2 Regulatory Framework

Cultural resources in California are managed under a broad spectrum of Federal and State statutes and regulations.

Federal agency involvement and Federal laws for the proposed project may include:

The Antiquities Act of 1906 (16 U.S.C. 431-433) was the nation's first general purpose cultural resource management statute prohibiting the excavation of antiquities from public lands without a permit from the Secretary of the Interior. In 1974, the Ninth Circuit Court of Appeals found the Antiquities Act to be vague due to its failure to indicate the age an object had to be in order to be considered an "object of antiquity." The result was the enactment of the Archeological Resources Protection Act (16 U.S.C. 470aa-mm: ARPA) that serves to manage disturbances to archaeological sites, features, and objects on Federal and Native American tribal lands.

The National Historic Preservation Act (NHPA) of 1966 (16 USC 470-470w-6) requires Federal agencies to consider the preservation of historic and prehistoric resources during project planning. The Act authorized the National Register of Historic Places (NRHP) and established the Advisory Council on Historic Preservation as an independent Federal entity. Section 106 of the Act requires Federal agencies to take into account the effects of their undertakings on historic properties and properties eligible for the NRHP.

The Advisory Council on Historic Preservation (36 CFR 800) establishes procedures for compliance with numerous historic preservation statutes, particularly Section 106 of the National Historic Preservation Act of 1966. These regulations also define the Criteria of Effect and Adverse Effect (800.5), stipulate procedures for affording the Council opportunity to comment (800.6), define the role of the State Historic Preservation Office (SHPO) in the Section 106 review process (800.7), set documentation requirements (800.8), and describe procedures to be followed should significant historic properties be discovered during construction (800.11).

The Native American Graves Protection and Repatriation Act of 1989 (PL 101-601) vests ownership or control of human remains and Native American cultural items excavated on Federal or tribal lands in California to designated Native American Tribes. The Act also requires notification of the appropriate Federal agency when Native American cultural items are discovered. It specifies that Federal agencies and museums provide an inventory of Native American human remains and associated funerary objects and to notify appropriate Native American tribes of this inventory. Furthermore, it provides for the repatriation of Native American human remains and cultural objects.

The California legal provisions that may be relevant to the proposed project are discussed below.

The California Environmental Quality Act of 1970:

a) CEQA is patterned after the National Environmental Policy Act (NEPA), but goes beyond NEPA in the extent of protection provided for archaeological and historic resources. State and local government entities are required to protect historic and prehistoric archaeological resources that qualify for the NRHP or are deemed significant.

b) Historic resources over 45 years in age must be evaluated for eligibility to the California Register of Historic Resources. The same criteria defined in 36 CFR 60.4 for the NRHP is used to determine eligibility for the California Register.

Numerous State (California) Public Resources Codes apply to proposed projects:

- California Public Resources Code 21083.2 (1993) provides for reasonable efforts to be made to preserve archaeological resources in place and or "left in an undisturbed state."
- The Native American Heritage Act of 1976.
- The Native American Heritage Act (NAHA) established the Native American Heritage Commission (NAHC) that protects Native American religious values on State property (California Public Resources Code 5097.9).
- California Public Resources Code 6313 (1995) provides title vested in the State to all abandoned shipwrecks and all archaeological sites and historic resources on or in the tide and submerged lands of California.
- California Public Resources Code 30244 (1993) states that reasonable mitigation measures shall be required where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer (SHPO).

5.6.3 Environmental Impacts

Along California's diverse coastline there is the potential for literally hundreds of cultural resources. Potentially significant prehistoric and historic resources important to the development of the coastal regions are known to exist both along the shoreline and in shallow waters. Shore based resources may include remnants of prehistoric campsites, quarries, ritual sites, rock art sites, permanent village sites, and various artifactual materials. Historic resources found on land may include structures such as residences, industrial buildings and complexes, small farms and fishing operations. Typical off shore resources may include sunken boats, fishing weirs and paraphernalia, abandoned docks, and artifacts. For this reason, there are potential impacts both offshore and onshore. The identification of prehistoric and historic resources and the determination of significance should be addressed during the preliminary review phase of site-specific project applications.

Methods and assumptions for evaluating impacts on cultural resources vary according to discipline. Impacts to paleontological and archaeological resources may occur as the result of ground disturbing activities. Impacts on historic structures may result from activities that modify physical features, the character or the setting. The significance of the impact depends largely on the relative importance of the resource.

Site-specific concerns related to archaeological and paleontological resources will be mitigated to acceptable levels in accordance with applicable State, Federal and local regulations prior to construction. As a result, any future aquaculture development will have less than significant impact with mitigation incorporated or no impact on cultural or paleontological resources. The following responses can thus be made to the CEQA Checklist questions provided at the beginning of this section. With mitigation in accordance with State, Federal and local laws and regulations, aquaculture facilities will not:

- Cause a substantial adverse change in the significance of a historical resource;
- Cause a substantial adverse change of an archaeological resource;
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature;
- Disturb any human remains, including those interred outside of formal cemeteries.

5.7 GEOLOGY AND SOILS

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☒	☐	☐
ii) Strong seismic ground shaking?	☐	☒	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☒	☐	☐
iv) Landslides?	☐	☒	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risk to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☒	☐	☐

5.7.1 Environmental Setting

California contains a wealth of mineral resources. The rich soil of Central Valley, the gold of the Sierra and oil in various locations throughout the state as well as offshore are all examples (CERES 1999). Geological studies are underway to increase the understanding of such diverse issues as earthquakes, mineral locations and volcanic hazards (CERES 1999). Geology of the region includes several mountain ranges and a dynamic coastline. The current shape of these features is the result of several erosional and depositional processes occurring through time.

The San Andreas Fault is located in this region. Mountain ranges were the product of volcanic and tectonic activity emanating from this fault. These geologic formations were then subjected to the erosional impacts of glaciation during the ice ages as well as by wind and rain to create the landforms present today. Coastal mountains trace a sinuous 800-mile course from the northwest corner of Del Norte County south to the

Mexican border. Except for a break in the chain at the Golden Gate, they form a continuous series of ranges and valleys, separating the coast from the Great Central Valley and the deserts of the interior. This mountainous barrier has a dramatic effect on climate: storms originating over the Pacific Ocean bring rain to the western slopes, while the eastern slopes remain relatively dry (CERES 1999).

Along the coastline waves continually shape the landscape, creating a highly dynamic system. Debris from wave erosion as well as sand deposited by streams and rivers accumulate and form the sandy beaches. Inland, where wind-blown sand from the beaches collects, fragile systems of coastal dunes exist. Coastal rivers and streams meet with the salty waters of the Pacific and create the marshes and lagoons that constitute coastal wetlands. In other areas, abrasive sand and wave motion cut grooves and pockets into the rock, forming intertidal communities and tidepools (CERES 1999).

The coast also comprises a discontinuous series of narrow, flat-lying marine terraces, or wave-cut benches, located between the sea cliffs and coastal mountain foothills. These terraces are characteristic of exposed, windward coasts where waves pound against the shore, cutting a vertical cliff face over time. The surging ocean then planes smooth the sea floor at the base of the cliff, forming the flat step of the submerged terrace. Terrace soils are generally thin, commonly composed of rock debris, marine fossils fragments, and shells that were deposited on the once-submerged terrace. These marine sediments are often buried under thick alluvial deposits of sand and gravel from streams and rivers crossing the terraces after they emerged from the sea. Grasses grow on many terraces. In Northern California, redwood and pine forests cover the terraces. On the Mendocino coast, a unique forest of pygmy cypress and pine trees has adapted to the sandy, nutrient-deficient soils on the upper marine terraces (CERES 1999).

Seaward edges of marine terraces, shaped by ocean waves and currents, and uplifted from the ocean floor are called coastal bluffs. Coastal bluffs are less evident along the Northern California coast where the coastal mountains plunge abruptly into the ocean. Coastal bluffs are comprised mainly of sedimentary rock such as sandstone and shale that are particularly prone to erosion. Grains of quartz, feldspar, and mica compressed into layers of sandstone crumble easily; when wet, shale and siltstone disintegrate, and clays and mudstones soften and liquefy. Lying on top of the sedimentary deposits of many bluffs is alluvial soil, loosely consolidated sand and gravel deposited by ancient rivers and streams (CERES 1999).

Rocky headlands are composed of igneous rocks—granites and basalts—that are resistant to wave erosion. Sea caves, sea stacks, and arches are created by erosion of less resistant components of coastal landforms. Sea caves are formed by wave erosion where fractures occur in the bluff face. Landslides and cliff retreat are part of the natural process of coastal erosion along the California shore. Waves that undercut bluffs often initiate landslides (CERES 1999).

Sand dunes are also an important part of California's coastline. Coastal sand dunes are shaped by wind into curving ridges and are among the most dynamic and fragile natural formations. Offshore sandbars and sediment deposited at the mouths of rivers are the most important sources of material for dune building; sediment is carried by longshore currents until a projection landform traps the particles and they are deposited on the beach by wave action. Dune formation begins when the wind blows dry sand particles landward from the beach (CERES 1999).

5.7.2 Regulatory Framework

Local agencies regulate most development projects within seismic fault zones under the Alquist-Priolo Act, which covers surface rupture hazards. Non-surface fault rupture hazards are covered under the Seismic Hazards Mapping Act of 1990. Construction activities and site development that has potential to impact soils in any river, lake, or defined waters of the U.S. is likely to undergo review via the CDFG Streambed Alteration Agreement and/or the Corps of Engineers Form 4345.

5.7.3 Environmental Impacts

Earthquake fault hazards are site-specific, and thus an assessment of seismic-related impacts is not within the scope of this PEIR.

Once they are in operation, marine aquaculture facilities cause no significant impact to the soils of the area. However, construction activities could produce some short-term disruption to soils. These activities are regulated though permitting agencies and therefore will have impacts that are less than significant or that have been mitigated to reduce the impacts to less than significant.

Potential impacts resulting from unstable soil, expansive soil, or sites with inadequate wastewater disposal systems, are dependent on the site and should thus be addressed in site-specific project applications.

5.8 HAZARDS AND HAZARDOUS MATERIALS

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) Be within the vicinity of a private airstrip, and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

5.8.1. Environmental Setting

Aquaculture facilities on occasion may use chemicals as therapeutants for the treatment of pathogens affecting the cultured species, or as a disinfectant/growth inhibitor to control undesirable species. Application of chemicals is dependent on the culture method. Therapeutants are able to be used only with land-based tank facilities, where it is possible to control the dosage applied to the culture or treatment vessel, or in floating or submerged cages through the use of medicated feeds. With any of the marine culture methods, an operator may choose to use an approved anti-fouling agent to treat nets,

lines, or other materials that are continually submerged.

5.8.2. Regulatory Framework

The use and discharge of chemicals in the aquaculture industry is monitored by the Regional Water Resources Control Boards through the WDR and/or NPDES permits. Specific restrictions for the discharge of chemicals from aquaculture operations may be defined based on the Water Quality Control Plan for each Region. For example, in the Water Quality Control Plan for the North Coast Region it specifically states that for aquaculture operations "The discharge of detectable levels of chemicals used for the treatment and control of disease, other than salt (NaCl) shall be prohibited."

The placement of any materials or chemicals that are in contact with the waters of the State that could discharge or release a substance that would impair the beneficial use of the receiving water, both ground and surface waters, is regulated by the Regional Water Control Boards (Luis Rivera, North Coast Regional Water Quality Control Board, pers. comm. 10/25/00).

Chemicals and therapeutants approved for use in the aquaculture industry is regulated by the U.S. Food and Drug Administration (FDA) through the Center for Veterinary Medicine (CVM). There are four categories that drugs or chemicals can be classified into depending on their use or application:

1) Registered or labeled drug or chemical. These compounds must be used in the manner described on the label.
2) Extra-label. This is the use of a registered drug or chemical in a manner outside the labeled requirements. Extra-labeled use is allowed as prescribed by a licensed veterinarian.
3) Investigational New Animal Drug (INAD). Use of drugs under an INAD is for the collection of data to support a New Animal Drug Application to either register a new drug or chemical or expand the existing label to cover additional species, rearing temperatures, and/or target pathogens. Specific reporting and testing requirements are required under the INAD program.
4) Low Regulatory Priority (LRP) compounds. FDA has developed a list of compounds that are felt to be relatively safe, and at this time do not need to meet the onerous licensing requirements for new drugs. These compounds must be used for the prescribed indications, at the prescribed dosages, are of an appropriate grade for food animals, applied in accordance with good management practices and do not adversely harm the environment. The compounds that have undergone review by the Food and Drug Administration and have been determined to be new animal drugs of low regulatory priority are listing in Table 5-1.

Table 5-1. Low regulatory priority aquaculture drugs.

Compound	Use
Acetic acid	1000 to 2000 ppm dip for 1 to 10 minutes as a parasiticide for fish.
Calcium chloride	Used to increase water calcium concentration to insure proper egg hardening. Dosages used would be those necessary to raise calcium concentration to 10-20 ppm CaCO3. Up to 150 ppm indefinitely to increase the hardness of water for holding and transporting fish in order to enable fish to maintain osmotic balance.
Calcium oxide	Used as an external protozoacide for fingerlings to adult fish at a concentration of 2000 mg/L for 5 seconds.
Carbon dioxide gas	Used for anesthetic purposes in cold, cool, and warm water fish.
Fuller's earth	Used to reduce the adhesiveness of fish eggs to improve hatchability.
Garlic (whole form)	Used for control of helminth and sea lice infestations of marine salmonids at all life stages.
Hydrogen peroxide	250-500 mg/L to control fungi on all species and life stages of fish, including eggs.
Ice	Used to reduce metabolic rate of fish during transport.
Magnesium sulfate	Used to treat external monogentic trematode infestations and external crustacean infestations in fish at all life stages. Used in all freshwater species. Fish are immersed in 30,000 mg MgSO4/L and 7000 mg NaCl/L solutions for 5 to 10 minutes.
Onion (whole form)	Used to treat external crustacean parasites, and to deter sea lice from infesting external surface of salmonids at all life stages.
Papain	Used of a 0.2% solution in removing the gelatinous matrix of fish egg masses in order to improve hatchability and decrease the incidence of disease.
Potassium chloride	Used as an aid in osmoregulation; relieves stress and prevents shock. Dosages used would be those necessary to increase chloride ion concentration to 10-2000 mg/L.
Povidone iodine	100 ppm solution for 10 minutes as an egg surface disinfectant during and after water hardening.
Sodium bicarbonate	142 to 642 ppm for 5 minutes as a means of introducing carbon dioxide into the water to anesthetize fish.
Sodium chloride	0.5 to 1% solution for an indefinite period as an osmoregulatory aid for the relief of stress and prevention of shock in fish; 3% solution for 10 to 30 minutes as a parasiticide.
Sodium sulfite	15% solution for 5 to 8 minutes on fish eggs to improve their hatchability.
Thiamine hydrochloride	Used to prevent or treat thiamine deficiency in salmonids. Eggs are immersed in an aqueous solution of up to 100 ppm for up to four hours during water hardening. Sac fry are immersed in an aqueous solution of up to 1,000 ppm for up to one hour.
Urea and tannic acid	Used to denature the adhesive component of fish eggs at concentrations of 15 g urea and 20 g NaCl/5 liters water for approx. 6 minutes, followed by a separate solution of 0.75 g tannic acid/5 liters of water for an additional 6 minutes. These amounts will treat approx. 400,000 eggs.

Notes:

1. The Agency's enforcement position on the use of these substances should not be considered an approval nor an affirmation of their safety and effectiveness. Based on the information available at some time in the future, the Agency may take a different position on the use of any or all of these substances.
2. Classification of these substances as new animal drugs of low regulatory priority does not exempt facilities from complying with other Federal, State, and local environmental requirements. For example, facilities using these substances would still be required to comply with National Pollutant Discharge Elimination System (NPDES) requirements. October 11, 1994, Office of Surveillance and Compliance, Center for Veterinary Medicine.

The use of many labeled or registered drugs and chemicals have a specified withdrawal time that must be adhered to. The withdrawal time specifies the period of time that must elapse before the treated animal can enter into the food chain or be used for human consumption.

Appropriate chemical storage and handling protocols are provided to the consumer by chemical manufacturers. The Department of Pesticide Regulation (DPR), authorized in 1991 through California's Food and Agricultural Code Section 11501, provides for the proper, safe, and efficient use of pesticides (including herbicides, fungicides, and other pest control agents). The program is further authorized to protect the environment from environmentally harmful pesticides by prohibiting, regulating, or ensuring proper stewardship of pesticides, and it assures agricultural and pest control workers of safe working conditions where pesticides are present (DPR 2001). The DPR provides the regulatory direction for appropriate chemical storage and handling protocols for any herbicides, therapeutants or other hazardous materials that may be used at an aquaculture facility. Specific requirements for storage, containment equipment and spill prevention plans would be addressed at the individual project level, when the particular materials and estimated annual usage could be identified.

5.8.3. Environmental Impacts

5.8.3.1. Bottom and Off-bottom Culture

The open water environment of this culture method precludes the use of therapeutants. Regulations implemented by the RWQCBs require that any in-water use of anti-fouling agents, biocides and preservatives be conducted such that potential impacts are maintained at less-than-significant levels; in response to these regulations some operators of bottom and off-bottom culture facilities have eliminated all use of the agents (HBHRCD 1999). Due to the limited use of mechanized equipment for bottom and off-bottom culture, the quantities of oil and fuel are very small and the potential impact from spill is less than significant.

5.8.1.2. Floating and Submerged Cages

These open water operations do not allow for the application of chemicals or therapeutants directly into the cage due to the inability to apply the material in a contained environment. The use of antimicrobial therapeutants administered through a feed application would be regulated by FDA. Most applications would occur as an extra-label use prescribed by a licensed veterinarian. Appropriate drug withdrawal times would have to be adhered to prior to the fish entering the human food market.

An operation for the culture of white sea bass has reported that no chemicals or therapeutants are currently used (Steve Crooke CDFG, personal communication October 23, 2000). Investigations into the requirements for the use of therapeutants in the marine cages is being conducted at present (Steve Crooke, CDFG, personal communication October 23, 2000).

Due to the limited use of mechanized equipment for floating and submerged cage culture, the quantities of oil and fuel are very small and the potential impact from spill is less than significant.

5.8.1.3. Land-Based Tank Facilities

Culture operations for marine fin fish species reports the use of the following chemicals or therapeutants; copper sulfate, formalin, freshwater, hydrogen peroxide, oxytetracycline and Romet, Chloramine-T (Steve Crooke CDFG, personal communication October 23, 2000 and Martin Chen CDFG, personal communication October 25, 2000). Oxytetracycline, Romet and Chloramine-T are used under an INAD by veterinary prescription as an extra-label use of that compound. Any cleaning agents used at the facility for equipment disinfection are discharged into the sewer system (Steve Crooke CDFG, personal communication October 23, 2000).

Culture operations for abalone have reported the experimental use of oxytetracycline under an INAD (Fred Wendel CDFG, personal communication October 23, 2000).

Future use of chemicals or therapeutants for the treatment of pathogens will most likely be through the INAD or extra-label processes. These applications are typically under the direction of a licensed veterinarian to ensure that proper application and use are followed.

Limited amounts of disinfectant chemicals are typically used at land-based tank facilities, along with small quantities of fuel and oil for equipment operation. Due to the extreme risk these chemicals pose to the aquaculture product, it is typical that the facilities have strict operational protocols in place regarding storage, application, and appropriate spill clean-up procedure. As a result, the potential impact from the use of hazardous materials at these facilities is less than significant.

5.9 HYDROLOGY AND WATER QUALITY

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☒	☐	☐
e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☒	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☒	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Cause inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

5.9.1 Environmental Setting

Water supply and water quality are critical components of any aquaculture project. From initial purchase through final sale, the products of this industry are living aquatic organisms with specific biological demands for and sensitivities toward water-borne

materials. If water quality conditions become degraded with respect to any biological tolerance of the cultured product, there may be an immediate impact to the health of the organism. Because of this response, the water quality conditions in water supply sources for aquaculture facilities tends to be of excellent quality or require only minimal treatment before use. Further, the water quality within an aquaculture facility exhibits a self-regulating process. If facility operations produce poor water quality within the rearing units, the result may be a reduced productivity or total loss of product.

Marine aquaculture facilities that utilize in-water rearing methods do not divert any water from the natural water course. Land-based tank facilities require marine water diversion from the ocean or estuary adjacent to the site, through the rearing units, and back to the source. In some cases, a land-based facility may develop a small freshwater well or spring supply for domestic use and possibly to supplement process water requirements.

Bottom and off-bottom culture facilities are typically located in the intertidal zone or in shallower subtidal zones, and often times near the junction between coastal streams and the ocean. Drainage patterns through these areas are affected by topographic conditions and by the volume of water of a particular tidal cycle or storm surge. Placement of facilities within these zones has the potential to impact existing drainage patterns, siltation conditions, and hydraulic capacity.

Drainage from proposed sites for land-based tank facilities will be limited primarily to storm water runoff from upland areas. Because these sites are adjacent to the coast, the area of the drainage basin contributing to the storm water runoff will most often be relatively small in comparison to the drainage basins of inland sites.

5.9.2 Regulatory Framework

The California Water Code, part of the statutory law for the State, contains provisions which control almost every consideration of water and its use. The control of water quality is regulated primarily through Division 7 of the Code, also referred to as the "Porter-Cologne Water Quality Control Act." The Act recognized that the statewide program for water quality could most effectively be administered regionally within a framework of statewide coordination and policy, and consequently established the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) as the principal State agencies responsible for control of water quality (CRBRWQCB 1994).

The Federal Clean Water Act (Public Law 92-500, as amended) provides for the delegation of certain responsibilities of water quality control and water quality planning to the states. Where the USEPA and the State Board have agreed to such delegation, the Regional Boards implement portions of the Clean Water Act, such as the NPDES program and toxic substance control programs.

Each RWQCB has formulated and adopted, for its region, a Basin Plan which a) identifies statewide and Federal plans that are relevant to the region, and b) establishes such water quality objectives as in its judgment will ensure reasonable protection of beneficial uses of water of the State. These Basin Plans are subject to continuous review and update as necessary. Updated sections of plans are subject to review by both the SWRCB and the USEPA.

A basic policy established by California's nine Basin Plans is that designated beneficial uses of State waters may not be degraded. Within each Basin Plan, a specific listing of designated beneficial uses is provided for each major hydrologic unit. Many beneficial uses that are common in the Basin Plans are listed in Table 5-2, along with the category abbreviation and definition.

One of the designated beneficial uses of State waters is Aquaculture, defined as the "uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes." Another beneficial use category is Shellfish Harvesting, defined as "uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g. clams, oysters, mussels) for human consumption, commercial, or sport purposes." The Aquaculture and Shellfish Harvesting categories are designated as existing beneficial uses in seven and six Basin Plans, respectively, as indicated in Table 5-3. Aquaculture projects located in hydrologic units where Aquaculture or Shellfish Harvesting are designated beneficial uses have a legal assurance that their water supply sources cannot be degraded without consideration of impacts to their aquaculture operations.

The intent of the Basin Plans is to optimize the beneficial uses of State waters by describing the water quality that must be maintained to support such uses. The implementation of these water quality standards is accomplished by the RWQCB by issuing and enforcing waste discharge requirements (WDRs) to individuals, communities, or businesses whose waste discharges may affect water quality. In addition, the RWQCB will administer any National Pollutant Discharge Elimination System (NPDES) permits required under the federal Clean Water Act (CWA), through the authority vested by the USEPA and SWRCB. Compliance with WDR and NPDES permit conditions insures that waste discharges from aquaculture projects will not produce significant impacts to other beneficial uses within the hydrologic unit.

The protection of certain waters has been assigned to the US Army Corps of Engineers (COE) under three Federal laws. Section 10 of the Rivers and Harbors Act regulates all activities that may affect a navigable water. The discharge of dredged or fill material in California's waters and wetlands is regulated under Section 404 of the CWA and additionally requires Water Quality Certification under Section 401 of the CWA. Section 103 of the Marine Protection, Research and Sanctuaries Act regulates the transportation of dredged material for the purpose of dumping into the ocean.

Table 5-2. Common designated beneficial uses for California's Basin Plans.

Beneficial Use	Description
Agriculture Supply (AGR)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
Industrial Service Supply (IND)	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white-water activities, fishing, or use of natural hot springs.
Non-Contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
Commercial and Sport Fishing (COMM)	Uses of water to support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic, vegetation, fish or wildlife, including invertebrates.
Wildlife Habitat (WILD)	Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses of organisms intended for human consumption or bait purposes.
Cold Freshwater Habitat (COLD)	Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
Rare, Threatened, or Endangered Species (RARE)	Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or Federal law as rare, threatened, or endangered.
Migration of Aquatic Organisms (MIGR)	Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.
Spawning, Reproduction, and/or Early Development (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
Estuarine Habitat (EST)	Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
Aquaculture (AQUA)	Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.
Navigation (NAV)	Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.
Marine Habitat (MAR)	Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
Shellfish Harvesting (SHELL)	Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, mussels) for human consumption, commercial, or sport purposes.

Table 5-3. Current status of the Aquaculture and Shellfish Harvesting beneficial use designations in California's nine Basin Plans.

Basin Plan	Beneficial Use Designation	
	Aquaculture	Shellfish Harvesting
North Coast Region Basin Plan	Existing	Existing
San Francisco Bay Region Basin Plan	Existing	Not Identified
Central Coast Region Basin Plan	Existing	Existing
Los Angeles Region Basin Plan	Existing	Existing
Central Valley Region Basin Plan	Not Identified	Not Identified
Lahontan Region Basin Plan	Existing	Existing
Colorado River Basin Region Basin Plan	Existing	Not Identified
Santa Ana Region Basin Plan	Not Identified	Existing
San Diego Region Basin Plan	Existing	Existing

5.9.3 Environmental Impacts

5.9.3.1 Water Supply Systems

Water supply systems for marine aquaculture facilities are limited to land-based facilities. Facilities that use bottom culture, off-bottom culture, floating cages, or submerged cages conduct operations directly in open water and therefore do not require constructed water supply systems.

The flow rate of sea water required for land-based tanks is dependent on the function and size of the facility. Culture involving broodstock conditioning, hatchery rearing, or algae production, for example, may be conducted as batch operations requiring only intermittent intake of a few hundred gallons of water. Growout operations, on the other hand, require a continuous, flow-through supply of sea water. For example, the largest abalone producer in California is currently using about 8 cubic feet per second of pumped sea water to maintain land-based grow-out and support operations.

Siting of a sea water supply intake for aquaculture use must consider factors of quality and access. Since the cultured organisms require consistent high quality water, it is not suitable to site intakes in areas with high industrial development or boat traffic, areas with large changes in salinity due to runoff or river flow, or areas with extensive runoff from agricultural fields. Most land-based facilities prefer intake sites that are largely devoid of algae, since the algae may compete with species under culture or rupture within the system and create conditions that are prone to bacterial growth (MSATS 2000a). To insure uninterrupted water supply, intakes must be located beneath the lowest tide level, with additional depth as required to meet the demands of system pumps, pipelines, and ancillary equipment.

5.9.3.2 Waste Discharges

The predominant wastes from aquaculture facilities are excess, uneaten feed (where feed is added to the system) and the metabolic by-products of feed digestion by the

cultured organism. (The use of medications and cleaning agents in aquaculture facilities are discussed in Section 5.8, Hazards and Hazardous Materials.) The chemical makeup of these wastes include organic carbon and organic nitrogen compounds present in the proteins, fats and carbohydrates of feed and feces, plus ammonium, urea, bicarbonate and phosphates (Pillay 1992). Excess feed and feces are introduced into the water as solids that soon differentiate into soluble (dissolved) solids, suspended solids, and settleable solids that may fall to the bottom as sediment. These wastes have the potential to create oxygen deficits in the receiving water due to the decay of organic solids and the creation of favorable conditions for aquatic plant growth (EPA 1998). In severe cases, the accumulation of sediment has affected water flow (Pillay 1992).

The five methods of mariculture rearing can be grouped into three categories that exhibit very similar discharge characteristics due to similarities in feeding practices and waste dispersal. The first category consists of bottom and off-bottom culture, which does not add any feed to the system and relies on open water to disperse metabolic wastes. Floating and submerged cage culture comprise the second category, since they are provided supplemental feed, but waste dispersal again relies on open water. Land-based tank facilities form the third category, characterized by supplemental feed and a waste stream discharged as a point-source.

5.9.3.2.1 Bottom and Off-bottom Culture

The key characteristic of bottom and off-bottom bivalve shellfish culture is that no feed is added to the system, relying instead on the filter-feeding mechanism of the cultured shellfish organisms to remove natural algae populations from the open sea water source. As a consequence, the major impact of bottom and off-bottom culture has been described as the removal of suspended sediments from the water column and deposition of these on the bottom (MSATS 2000a). Ecologically, this is generally viewed as positive because it clears the water column. On the bottom, materials are remineralized through a variety of processes, including the conversion of organic nitrogen into nitrogen gas with subsequent discharge from the system. The incorporation of nitrogen into shellfish tissue with eventual crop harvest is another means by which nitrogen is removed from the system. Current investigations are measuring the effectiveness of increased shellfish populations (either through aquaculture or oyster reef restoration) to improve water quality in degraded bays and eutrophied fjords (Haamer 1996, MSATS 2000a, Newell 1996). There are indications that increasing the stocks of suspension feeders produces the beneficial effect of removing phytoplankton from the water column without stimulating further phytoplankton production (Newell and Cornwell 2000). Furthermore, net rates of nitrogen loss via denitrification may be enhanced where there are higher levels of suspension feeders (Newell and Cornwell 2000).

The rate of sediment deposition from bivalve shellfish is well documented, with observed dependencies to species, density, feed concentration, feed particle size, and temperature (Tenore and Dunstan 1973, Bricelj and Shumway 1991, Pillay 1992). The accumulation of that sediment, on the other hand, is more difficult to predict as it is determined primarily by flushing and water movement characteristics of the culture area. These water movement characteristics exhibit normal variation through tidal cycles, seasonal weather patterns, and storm events. It is typical, therefore, to observe some changes in sediment elevation in both natural and cultured shellfish areas.

The placement of longlines, racks, stakes and other structures for off-bottom culture creates the potential for changing water movement characteristics through a culture area. If water movements are slowed, it may reduce the ability of the water flows to carry sediment, resulting in increased sediment accumulation in the vicinity of the structures. Conversely, in areas where water movement speeds up to move past an obstruction, there may be an increased capacity for sediment transport and subsequent lowering of the bottom elevation.

Changes in water movement and bottom elevation have the potential to affect biological resources such as eelgrass and benthic invertebrates. These concerns are addressed in Section 5.5 of this document.

USEPA's NPDES program specifies that permits are required for cold-water aquaculture facilities producing more than 20,000 pounds of fish per year and feeding more than 5,000 pounds of food in any one calendar month. Since bottom and off-bottom culture facilities do not add fish food (nutrients) to the water to promote shellfish growth, these facilities are exempt from the NPDES permit program. This policy was upheld in a recent Federal court case that concluded there is no "discharge of a pollutant" with these facilities, as there is no physical production of "a pollutant into water from the outside world" (MSATS 2000b).

5.9.3.2.2 Floating and Submerged Cages

The types of discharges from floating and submerged cages will depend upon the species under culture, the type and quantity of feed used, and the management practices of the facility in question. For example, the discharge related impacts of cage culture of abalone, an herbivore consuming locally harvested kelp may be similar to off-bottom culture of bivalve shellfish in resulting in a net removal of nitrogen from the environment when the abalones are harvested. The primary discharges from floating and submerged cages where animals are fed commercial feeds, are uneaten fish feed and the metabolic wastes of this feed. The chemical characteristics of these wastes that have the greatest potential to impact receiving waters include biological oxygen demand (BOD), total suspended solids (TSS), nitrogen, and phosphorus. The TSS and phosphorus compounds are primarily settleable solids, while the BOD and nitrogen loads consist predominantly of dissolved materials. Several studies examining the waste loading and waste fraction distribution from marine salmonid cage culture facilities were reviewed by USEPA (1992) to suggest the following average waste loading conditions:

Parameter	Waste Loading (lbs/lbs fish/yr)	Dissolved Fraction	Settleable Fraction
BOD	0.400	75%	25%
TSS	0.800	14%	86%
Total N	0.080	83%	17%
Total P	0.012	14%	86%

Cage culture relies on a continual flushing from the surrounding open water to disperse wastes away from the cage area. As a consequence, water depth, bottom topography, currents, and wave action all play a significant role in determining waste impacts. With inadequate flushing, the dissolved wastes from cage facilities have the potential to adversely affect aquatic organisms in the area, including the cultured organisms

themselves. The settleable solids have the potential to accumulate on the bottom under the cages, initially producing enriched sediments. If the rate of enrichment exceeds the rate at which sediments and biota can assimilate the wastes, degrading sediments will result in anoxia, the production of hydrogen sulfide and methane gases. Such conditions are toxic to most benthic organisms (BCEAO 1997).

The discharge related impacts of cage culture can be successfully mitigated through effective best management practices (BMPs). By careful feed management, the use of appropriate stocking densities, careful monitoring of environmental conditions and stock health, and other appropriate BMPs, aquaculture activities can minimize potential impacts on the environment. Section 5.5.3.1.2 provides a discussion of monitoring practices that have been implemented in Washington State to assure there is no significant impact to the benthic communities surrounding salmon net-pens.

The implementation of regulations regarding siting and sizing of cage facilities has been one means of preventing waste discharge impacts from these facilities. In Washington, the minimum water depth and mean current velocity for a given site determine the maximum allowable annual production from a floating cage facility (WDOE 1986). In this way, the probable waste load from the facility is maintained below the expected rate of waste assimilation in the sediment. In addition, Washington requires that all commercial cage facilities, regardless of annual production or monthly feed level, conduct periodic environmental monitoring to characterize any environmental impacts resulting from the cage operations and to assure compliance with State Water Quality Standards and applicable Sediment Quality Standards (WDOE 1997).

Floating and submerged cage aquaculture facilities will be required to obtain a waste discharge requirement (WDR) permit. In addition, facilities that produce more than 20,000 pounds of cold water organisms or 100,000 pounds of warm water organisms each year are usually required to obtain a NPDES permit. In California, these permits are administered through the RWQCB. Discharge characteristics that are commonly regulated in these permits include TSS, settleable solids, dissolved oxygen, pH, and temperature. Since these facilities will be in compliance with discharge standards, potential impacts to water quality will be less than significant.

5.9.3.2.3 Land-Based Tank Facilities

Land-based tank facilities used for marine production share common waste discharge characteristics in that 1) feed is added to the water supply to provide nourishment for the cultured organisms, and 2) the effluent discharge constitutes a point-source loading, unlike the waste dispersal that occurs with in-water rearing methods. The primary discharges from tank facilities are uneaten feed and the metabolic wastes of this feed. Just like the concerns noted in the previous subsection for cage facilities, the chemical characteristics having the greatest potential to impact receiving waters include BOD, TSS, nitrogen, and phosphorus. Typical loading rates for these parameters have been established for several types aquaculture production, such as salmon net pen facilities (USEPA 1992) and freshwater trout production (Piper et al. 1982; Castledine 1986). It is unknown at this time, however, whether waste loading rates have been established for the marine species commonly grown in land-based tanks, such as abalone.

Some of the particulate waste from excess feed and feces will typically settle out within the rearing tank of a growout facility, unless there are very strong water currents to

provide continuous flushing of the waste. Most tank facilities consequently conduct periodic cleaning operations to remove accumulated waste, at intervals ranging from daily to seasonally depending on rate of deposition. There is strong incentive to conduct this maintenance as needed , since tanks not cleaned on a regular basis run the risk of developing poor water quality conditions that can inhibit fish growth and in extreme cases result in catastrophic loss of product.

Several techniques have been developed for land-based aquaculture facilities that aim to facilitate tank cleaning as well as minimize waste load impacts to the receiving water. The relevance of these techniques are dependent on project-specific traits such as total flow rate, land availability, product density, and tank dimensions. Sample techniques include:

- Full-flow settling ponds, in which the entire effluent flow is passed through a settling pond prior to discharge. Solids are periodically removed from the settling pond to assure adequate retention volume.
- Off-line settling ponds, which receive flow only from cleaning operations. Cleaning wastes are diverted to the treatment pond using separate pipelines other than the normal overflow drains. A common method for collecting the wastes is the use of a vacuum-type suction wand.
- In-pond settling, feasible in large ponds having low flow, where the pond itself acts as a settling pond. After fish harvest, water is diverted around the pond to allow removal of solids.

Regardless of the selected treatment method, all waste discharges must comply with waste discharge requirements (WDRs) established by the local RWQBC. Projects intending to produce more than 20,000 pounds of cold water organisms or 100,000 pounds of warm water organisms each year will also be required to obtain a NPDES permit. In California, these permits are administered through the RWQCB. Discharge characteristics that are commonly regulated in these permits include total TSS, settleable solids, dissolved oxygen, pH, and temperature. Since these facilities will be in compliance with discharge standards, potential impacts to water quality will be less than significant. In many cases, the facility will use common methods of waste treatment to mitigate the impacts to the less than significant condition.

5.9.3.3 Storm Water Discharges

In 1990 the USEPA established regulations that require NPDES permits for discharge of storm water associated with certain industrial activities. The only activity within the regulations that has relevance to aquaculture projects is construction activities that disturb five or more acres of land. NPDES permits in California are administered by the SWRCB, which has elected to implement the construction activities discharge permit by adopting a statewide General Permit. The General Permit requires all dischargers where construction activity disturbs five acres or more to:

- Develop and implement a Storm Water Pollution Prevention Plan (SWPPP) which specifies Best Management Practices (BMPs) that will prevent all construction pollutants from contacting storm water and with the intent of keeping all products of erosion from moving off site into receiving waters.
- Eliminate or reduce nonstorm water discharges to storm sewer systems and other

waters of the nation.

- Perform inspections of all BMPs.

The review and approval of General Permit applications is the responsibility of the local RWQCB. Implementation and oversight of the SWPPP throughout the life of the construction activity will provide effective pollution prevention for storm water discharges and will ensure compliance with the Clean Water Act and the California Water Code. As a result, potential impacts to water quality deriving from storm water discharges from aquaculture facilities will be less than significant.

5.9.3.4 Construction Activities

Temporary impacts to water quality may occur during construction of an aquaculture project as a result of ground disturbance activities. Construction of facilities for in-water rearing methods will typically be limited to anchoring small structures to the substrate, such as the support posts used for long-line culture, or the anchors that secure floating or submerged cage culture facilities. These activities would result in a short-term suspension of substrate particles. Estimates of the sedimentation rate for such activities have not been identified at this time, but it is anticipated that levels would be less than the normal siltation and resuspension of sediment that occurs with natural tidal cycles and storm events. Construction of in-water facilities will require a permit from the Corps of Engineers (COE) since the activity will involve placement of a structure within navigable coastal waters. If the Corps determines that the construction activities may produce a significant adverse impact to water quality, then conditions would be imposed in the permit to mitigate those impacts to levels that are less than significant.

Construction of land-based tank facilities will usually involve the installation of water intake structures and outfall structures within the jurisdictional limits of the COE permit described in the preceding paragraph. The land-based marine facilities are consequently expected to undergo the same Corps permit review process that will reduce potential impacts from this in-water construction to less than significant levels. In addition, land-based tank facilities will involve construction activities at upland locations. When these activities involve clearing, excavation, and grading that result in a land disturbance of five acres or more, it will be necessary to obtain an NPDES permit to address storm water discharges as described in Section 5.9.3.3. Between the Corps permit and NPDES permit, all potentially significant adverse impacts from construction activities at land-based aquaculture facilities will reduced to levels that are less than significant.

5.9.3.5 Water Quality Monitoring

All bivalve mollusks harvested commercially for human consumption must come from growing water which meet standards of cleanliness established by National Shellfish Sanitation Program (NSSP). These standards set maximum allowable levels for bacteria and other contaminants in the water. The Environmental Management Branch with the California Department of Health Services (DHS) is responsible for identifying areas in which the water quality is acceptable for harvesting shellfish for human consumption. In some cases, an area may be classified as a conditionally approved area, allowing shellfish harvest except during relatively short periods of time when it does not meet

the water quality standards and must be closed (such as after periods of heavy rainfall).

Aquaculture facilities producing bivalve mollusks for human consumption must obtain a Shellfish Growing Area Certificate to insure the water quality meets NSSP standards. Facility operators are also required to submit product samples to the DHS laboratory on a weekly basis during harvest to test for the presence of marine biotoxins that cause paralytic shellfish poisoning and domoic acid poisoning. Water quality monitoring that occurs as a result of these two certification processes may detect conditions that are a risk to public health. Aquaculture facilities may hence provide an indirect benefit to public safety by identifying water quality conditions that a) require closure of commercial and recreational shellfish harvesting, or b) indicate the need for improved waste discharges from sources such as sewage treatment plant, marinas, agricultural operations, and the like.

5.9.4 Summary Discussion of Thresholds of Significance and Mitigation Measures

The potential for an marine aquaculture facility to have a significant adverse effect on hydrology and water quality has been discussed in the preceding subsections from a programmatic basis, focusing on four issues that most commonly arise with these types of projects. The specific extent to which these effects may occur, and the mitigation measures that will successfully reduce these effects to a level that is less than significant, will be dependent on site-specific characteristics. During review of an individual aquaculture project, the local agency and all responsible agencies will ensure these site-specific features comply with the relevant laws establishing their respective permit authority. The following table reiterates the hydrology and water quality issues raised in the environmental checklist and in the preceding subsections, provides a general threshold of significance, and summarizes mitigation measures that, when necessary, can be applied on a case-by-case basis to reduce the hydrology and water quality impacts to levels that are less than significant.

Issue	Potential Threshold of Significance	Potential Mitigation Measures to Reduce Impact to Less than Significant
Groundwater depletion	Proposed well system has withdrawal rate large enough to suggest potential lowering of the local groundwater table level. (Note: low likelihood for marine facility.)	• Provide results of well test indicating acceptable level of impact on pre-existing nearby wells • Revise proposed withdrawal rate to avoid or minimize impact
Water quality and waste discharge	Projected waste discharge characteristics exceed water quality standards of receiving water	• Comply with conditions of approved WDR and NPDES permits (as warranted) • Off-bottom and cage culture might entail monitoring to ensure adequate dispersal of wastes • Land-based facilities can use settling ponds or other methods to reduce solids loading

(continued next page)

Issue	Potential Threshold of Significance	Potential Mitigation Measures to Reduce Impact to Less than Significant
Erosion and siltation	Proposed project construction disturbs five or more acres of land, and/or requires installation of in-water structures	• Implement Storm Water Pollution Prevention Plan • Comply with conditions of approved Streambed Alteration Agreement and/or Corps permit (as warranted)
Stormwater drainage	Proposed site development alters rate or volume of stormwater drainage	• Provide stormwater detention facilities as required by local ordinances
Increase in flood potential	Proposed project involves in-water structures that significantly alter cross-sectional area of stream or river	• Provide engineering report indicating acceptable level of change to upstream and downstream surface water profiles
Exposure to flood hazard	Proposed project places housing in 100-year flood hazard area or presents significant risk of loss people or structures due to flooding	• Relocate housing outside of flood hazard area • Avoid or minimize operations and structures inside the flood hazard area

5.10 LAND USE AND PLANNING

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with applicable environmental plans, policies, or regulations of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☒	☐	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☒	☐	☐

5.10.1 Environmental Setting

The physical aspects of the California coastline are tremendously varied. Because of this diversity, the coast is comprised of many different land uses, including marine sanctuaries, open space, coastal dependent industry, residential homes, metropolitan facilities, and recreation and commercial attractions. Generally the coastal zone ranges from three miles out to sea, to 1,000 yards inland. This distance varies depending on the level of development. For example, the coastal zone of developed urban areas may extend inland less that 1,000 yards from the mean high tide of the area or, in less developed areas (estuaries, watersheds) the coastal zone may extend as far as five miles inland.

Coastal land uses in southern California can be characterized as urban, with dense populations living along the coast, numerous ports and piers supporting coastal dependent industries, and heavily utilized beaches for recreational purposes. Central California coasts are also densely populated in areas but the coastline is more rugged and open. Northern California coastal land uses are more rural with much less development.

5.10.2 Regulatory Framework

The California Coastal Commission requires local governments to develop Local Coastal Programs (LCPs). The policies must be consistent with the Coastal Act (Articles 5, 6, and 7 of the Public Resources Code). In the case of the California coast, there are 15 counties and 58 cities with separate LCPs. Several of these have adopted, or are in the process of adopting, land use plans (LUPs).

The California Coastal Act supports aquaculture land use in several ways. Section 30222.5 states:

> *Ocean front land coastal-dependent developments shall have priority over other developments on or near the shoreline. Except as provided elsewhere in this division, coastal-dependent developments shall not be sited in a wetland. When appropriate, coastal-related development should be accommodated within reasonable proximity to the coastal-dependent uses they*

support.

Section 30230 states:

Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

And Section 30233 states:

(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:

- *New or expanded port, energy, and coastal-dependent industrial facilities, including commercial fishing facilities.*
- *Nature study, aquaculture, or similar resource dependent activities.*

5.10.3 Environmental Impacts

Aquaculture programs are considered to be a coastal dependent industry and have priority over other developments along the shoreline. However, they must be consistent with applicable LCPs and other sections of the Coastal Act. Each individual project must obtain a Coastal Development Permit from the local city or county planning department. Each project will be reviewed to determine consistency with the applicable LCP and to determine compliance with CEQA. If the project is not consistent with the applicable LCP, then the local agency has the authority to reject the project or require project specific mitigation and/or other project alternatives.

Coastal aquaculture facilities that are developed and operated in conformance with environmental plans, policies, or regulations of an agency with jurisdiction over the project will have a less than significant impact with mitigation. The possibility to conflict with any applicable habitat conservation plan or natural community conservation plan is also less than significant with mitigation.

5.11 MINERAL RESOURCES

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☒	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

5.11.1 Environmental Setting

Mineral resources found onshore and offshore of the California coast include oil and gas reserves, sand and gravel deposits. There are currently 42 oil and gas leases off the coast of California. Of these 42 leases, maintained by the State Lands Commission, 17 are still functioning, one is being used for water injection in association with producing leases, and the remaining 24 have no production. Of these 24 leases, five have never had production. Oil and gas production includes drilling platforms, wells, and offshore and onshore pipelines.

Sand and gravel deposits are most likely to be found at river mouths as they enter the Pacific Ocean and in bays and estuaries. Sand and gravel mining entails dredging or suctioning up the sand and gravel from the bottom of the water body.

5.11.2 Regulatory Framework

The State Lands Commission (SLC) leases and manages sovereign tidelands, submerged lands, and beds of navigable waterways under its jurisdiction. Anyone proposing to use such State-owned sovereign lands must first obtain a land use lease from the SLC. Authorization is also required from SLC for dredging, mining and oil, and gas, or geothermal exploration activities. The lease or permit required is covered in the appropriate sections of the Public Resource Code.

5.11.3 Environmental Impacts

The construction and operation of coastal aquaculture facilities have the potential to impact availability of a known mineral resource that would be of value to the region and the residents of the state or a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. Aquaculture facilities would not likely be sited in areas currently mined for sand and gravel deposits due to dredging operations. Project applicants wanting to site an aquaculture facility within an active lease area would be responsible for contacting lease holders to resolve potential conflicts between the two operations. These resolutions would result in no impact or less than significant impacts to mineral resources.

5.12 NOISE

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Expose persons to or generate excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) Generate a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) Generate a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) Be within the vicinity of a private airstrip, and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

5.12.1 Environmental Setting

Noise is defined as unwanted or objectionable sound, and airborne sound can be described as a rapid fluctuation of air pressure above and below the atmospheric pressure. Sound magnitude is expressed in logarithmic (power of 10) ratios called decibels (dB). These are derived by comparing measured sound pressures to a reference pressure. The unit of measurement of frequency is Hertz (Hz) (defined as one vibration per second). The human ear responds to sounds with frequencies in the range of 20-20,000 Hz. Most audible sounds do not consist of a single frequency but rather a broad band of frequencies with each differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies that comprise a sound in accordance with a weighting. The weighting reflects the fact that human hearing is less sensitive at low frequencies and extreme high frequencies than in the mid-range. This is called A weighting, and the decibel level thus measured is called the A-weighting sound level (dBA).

Marine aquaculture facilities in California are likely to be located in rural coastal areas. Agriculture is the dominant business in most of these areas, and existing noise patterns dominated by the operation of farm equipment.

5.12.2 Regulatory Framework

Noise standards have been established by Federal, State, and local governments. The

USEPA, under the provisions of the Noise Control Act of 1972, is responsible for establishing emission standards for new products. The Noise Control Act of 1972 preempts State and local regulations.

The allowable noise exposure for industrial workers is regulated by the OSHA, and the noise standards for residential housing is published by the Department of Housing and Urban Development (HUD). For noise-sensitive land uses (e.g., residences, schools, churches, and hospitals) the majority of Federal agencies consider a 65-dBA Ldn level as a general dividing line between an acceptable and an unacceptable noise environment.

Applicable regulations that apply primarily to onsite conditions include the Cal/OSHA (Occupational Health and Safety Administration) occupational noise exposure regulations. There are no direct State regulations for offsite (i.e., environmental or community) noise control, although the Model Community Noise Control Ordinance issued in 1977 by the Department of Health Services, Office of Noise Control may be applied as a set of covenants, codes, restrictions and recommendations by HUD. The Office of Noise Control may be applied as a set of evaluation criteria. For the most part, these recommendations are similar to the provisions of the covenants, codes, restrictions and recommendations by HUD. The Office of Noise Control of the State of California, Office of Environmental Health Hazards Assessment, delineates criteria for defining "clearly acceptable" and "conditionally acceptable" daytime and nighttime noise levels for single-family and multiple-family residential and other land uses.

5.12.3 Environmental Impacts

Potential sources of noise from marine in-water production facilities include service boats, motors, portable pumps, generators, and incidental noise from personnel working on the facility. Floating cage facilities may also create noise impacts from the occasional use of anti-predator noise guns. Equipment for in-water facilities is usually used only intermittently and primarily during daytime hours when most operations take place. Because of the usual absence of obstructions above the water surface, noises produced by in-water facilities will tend to carry further than would be expected for a similar noise source located on land.

Potential sources of noise from land-based facilities include pumps, generators, and utility and delivery vehicles. Generators are typically used infrequently, such as during a power outage. Facilities with salt water supply systems are likely to have pumps operating continuously. Noise would primarily occur during daytime hours when most operations take place. Land-based tank facilities would exhibit noise patterns that are likely to be very similar to typical agricultural farm operations.

CEQA regulations define a significant effect as an action with the potential to substantially increase the ambient noise levels for adjoining areas. Both in-water and land-based aquaculture facilities are expected to produce noise levels that are comparable to ambient conditions, and therefore there will be less than significant impacts to noise.

5.13 POPULATION AND HOUSING

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐

5.13.1 Environmental Setting

The 2000 U. S. Census indicates that approximately 66% of the California population is located in the coastal counties. The LCPs for each city/county will indicate residential areas and development limitations. As discussed under the Land Use Section, southern California has dense urban areas along the coast and central California has pockets of dense urban areas along the coast. Northern California is less urbanized, with a smaller population concentrated at the coastline.

5.13.2 Regulatory Framework

Housing along the California coast is primarily managed and regulated by local city and county planning departments. Any person or public agency planning development within the coastal zone must obtain a Coastal Development Permit from either the Coastal Commission or the city or county having authority to issue coastal development permits. New development must be consistent with the local LCP, and specifically with its housing element.

5.13.3 Environmental Impacts

Most marine aquaculture facilities would be constructed offshore, not within residential areas. However, some aquaculture facilities could potentially be located offshore in areas that would not be compatible with nearby residential areas. It is unlikely that local planning departments would permit aquaculture facilities in close proximity to residential areas. Aquaculture businesses typically employ a small number of people, and would not result in substantial population growth in an area. The typical range of hired workforce is 28-35 and based on the general skills required to construct and operate these facilities, workers would likely be hired from the existing local workforce. Thus, aquaculture projects would result in less than significant impacts to population or housing.

5.14 PUBLIC SERVICES

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?	☐	☐	☒	☐
b) Police protection?	☐	☐	☒	☐
c) Schools?	☐	☐	☒	☐
d) Parks?	☐	☐	☒	☐
e) Other public facilities?	☐	☐	☒	☐

5.14.1 Environmental Setting

Public services are typically provided to development projects by a variety of local purveyors (i.e., city, county, special district, school district). The services available vary depending on the level of development in the area. Aquaculture facilities require little or no public services. No government facilities or structures would be physically altered by construction of the proposed coastal aquaculture facilities.

5.14.2 Regulatory Framework

Regulatory guidance relates to the provision of adequate public services to meet the needs of the service area. These levels are set by local planning agencies.

5.14.3 Environmental Impacts

It is not anticipated that aquaculture facilities would require fire, police or other public facilities at a level that would impair existing service levels and response times. Due to the small number of employees required for coastal aquaculture, there would be no need for new public facilities or the alteration of government facilities. Therefore, there are less than significant impacts to public services.

5.15 RECREATION

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

5.15.1 Environmental Setting

Tourism is defined as leisure vacation travel requiring transit over 50 miles or an overnight stay. Recreation is defined as leisure activities in which participants travel less than 50 miles and do not require an overnight stay. Using these definitions, the California Research Bureau determined that ocean and coastal tourism contributed $9.9 billion to the State's economy in 1992. In 1994, CalTour estimated that 32 million resident trips and 7 million non-resident trips (not including international visitors) were made to visit beaches or waterfront areas by traveling more than 50 miles, with coastal cities being a strong attraction for out-of-state visitors. California is the first in the nation for travel earnings, domestic visitors, and overseas visitors (CERES 1999).

Based on number of visitors in 1991, the State's top ten recreational attractions are: Golden Gate National Recreation Area, Disneyland, Old Town San Diego State Historic Park, Universal Studios, Knott's Berry Farm, Yosemite National Park, Sea World, Six Flags Magic Mountain, Huntington State Beach, and Santa Cruz Beach Boardwalk. California residents participate in beach activities, visiting museums/historic sites and recreational walking (CERES 1999). Ocean and coastal activities play an important role in recreation for California. Marine and beach activities that residents and tourists make use of include boating, surfing, windsurfing, kayaking, and canoeing.

5.15.2 Regulatory Framework

Recreation resources are typically managed through Federal, State, or local governments and their respective land use plans and planning agencies. Uses of recreation resources that conflict with the intended recreational use of the managed land or water is typically deemed incompatible and not authorized. Additionally, potential impacts on recreational resources are evaluated through the CEQA process.

5.15.3 Environmental Impacts

Aquaculture facilities have the potential to impact recreational activities by obstructing access to shore or water areas traditionally used for recreation, or disrupting the intrinsic and visual quality of the area. If facilities are located in areas used for recreational boating or fishing, they could reduce the use of these areas, or require

recreational boaters to travel around the facility. The extent of reduced use and boat rerouting is not expected to be so significant that it would cause increased use of nearby facilities at a rate that would accelerate physical deterioration; nor is it expected to result in the need to construct or expand facilities. However, if site-specific conditions of a proposed project indicate there would be significant adverse impact to boating or other form of recreation, then these issues would be addressed and mitigated through land use and planning avenues, as discussed in Section 5.10.

5.16 TRANSPORTATION/TRAFFIC

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated road or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

5.16.1 Environmental Setting

A variety of roads comprise one component of land transportation. Some roads are two-lane dirt roads that serve rural areas, other roads are four lanes and have higher traffic volumes. Major highways and expressways exist throughout the state and usually provide access to the larger cities. All roads serve two primary functions – to provide access to individual parcels, and to accommodate the movement of goods, services and people. Approximately 50% of the state's energy consumption results from transporting both goods and people. Since 1973, the number of vehicles within the state has increased by 75% (California Energy Commission 2001).

Vessels utilizing coastal waters vary from large bulk cargo and container ships to towboats, commercial fishing boats, recreational boats, and other assorted watercrafts. Recreational boating is also prevalent. Data are not available on the densities of recreational boaters at specific locations and the routes used by boaters to get from their point of origin to their destination. However, destinations usually have an amenity such as access to a State marine park, public beach, recreational fishing "hole," marina, or retail goods like restaurants and stores. In addition, many commercial and recreational boats will use protected bays for shelter during storms (WDF 1990).

5.16.2 Regulatory Framework

Guidelines prepared by the Institute of Transportation Engineers (1988) indicate that a detailed traffic impact analysis would be warranted whenever a proposed project would generate 100 or more additional peak-hour trips in the peak direction. In addition, any increase in peak-hour trips that would result in the reduction of the existing level of service for a road would be considered significant.

If the proposed aquaculture facility is located in navigable waters of the U.S. and involves any structures that might be an aid or obstruction to navigation, the project proponent must submit a permit application to the U.S. Coast Guard using the form titled **Private Aids to Navigation Application (CG-2554)**. Review of this form by the U.S. Coast Guard will determine what requirements might be placed on the proposed structures.

5.16.3 Environmental Impacts

Roads will not be impacted by the proposed action. Trucks carrying supplies and equipment will use public roads to access the facilities and farm employees will also use roads to travel to and from work. However, the low numbers of employees and low volume of deliveries will cause a less-than-significant impact to land-based traffic.

In-water aquaculture facilities are fixed objects in the water. They can impact marine navigation if sited in established navigation lanes, narrow channels, or where boats would be unable to navigate safely around them. In addition, if structures break loose from their anchors during severe weather conditions they could become a hazard to vessel traffic. If facilities are inadequately lighted or made visually unobtrusive, they pose a greater risk to navigating vessels and may be a significant safety hazard, especially at night or during inclement weather (WDF 1990).

Placement of one or more aquaculture facilities in an embayment may affect safe anchorage. During inclement weather, recreational boaters and towboats may seek sheltered bays for protection from storms. If floating structures restrict the use of a sheltered bay for anchorage by blocking channels or limiting maneuverability, towboats and other boaters may have to travel to the next available safe anchorage. Depending on the weather conditions, this could create a hazard for the boat, passengers, or commercial cargo (WDF 1990).

Aquaculture facilities located near shore would affect navigation in a manner similar to a long dock, a marina, or a series of anchored boats. Most commercial traffic will tend to stay in deeper water, thus avoiding such areas. However, some commercial traffic such as towboats towing barges or log rafts may hug the shoreline. The further offshore the facility is located, the greater the navigational risk because structures are not expected, reference points are not nearby, traffic is more intense, and vessels are usually travelling at a faster rate (WDF 1990). However the potential impacts that facilities may have on marine vessels would be mitigated with the use of navigational and safety markers.

In-water aquaculture facilities may also have a beneficial impact on navigation. In more remote areas aquaculture facilities can provide a point of assistance or refuge for boaters. Some larger sites, such as floating cage facilities, may have some form of sea-to-land communication, offering additional assistance when needed.

IN-WATER PROJECTS LOCATED IN NAVIGABLE WATERS WILL BE REVIEWED BY THE U.S. COAST GUARD TO ASSURE THERE IS NO OBSTRUCTION TO NAVIGATION AND TO DETERMINE THE NAVIGATIONAL AIDS, IF ANY, THAT WILL BE REQUIRED FOR PLACEMENT ON PROPOSED STRUCTURES.

5.17 UTILITIES AND SERVICE SYSTEMS

Would the project:	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
f) Comply with Federal, State, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

5.17.1 Environmental Setting

Most utilities and service systems used by aquaculture facilities are provided by local agencies or utilities. Solid waste disposal services are provided by local government or private businesses. Sewer and water services, where available, are usually provided by purveyor districts in rural areas and by municipalities in more urbanized areas. Electrical power is supplied by State regulated utilities throughout California.

5.17.2 Regulatory Framework

Regulatory guidance relates to the provision of adequate services to meet the needs of the service area. These levels are set by local planning agencies.

5.17.3 Environmental Impacts

Marine aquaculture facilities using in-water production methods usually require only small amounts of fresh water or electricity, if any. In-water projects located close to shore may choose to install a waterline to provide fresh water for drinking, spraying down nets, and rinsing walkways. In addition, an electric cable can power electrically-powered compressors, feeding mechanisms, and lights (WDF 1990).

When in-water projects are located a considerable distance offshore, bottled water is used for drinking. A portable pump may be used to wash down nets and walkways and other power requirements are typically addressed through intermittent use of

portable generators.

Land-based tank facilities for marine production typically require continuous operation of saltwater supply pumps. Additional electrical capacity may be required for water treatment equipment, building lighting and ventilation, and site lighting. Required electrical load would be comparable to or slightly greater than typical agricultural businesses, and the demand would not be expected to impact the capacity of the local utility provider. Water and wastewater requirements at land-based facilities would be primarily limited to domestic needs for employees. Most sites for land-based facilities are located close to existing service lines for electricity, water and sewer. In remote areas without available sewer, wells and on-site septic systems may have to be installed.

Marine aquaculture facilities have an insignificant demand on electrical power, water and wastewater facilities. Therefore, the proposed action will have no impact on utilities and service systems.

5.18 GROWTH INDUCING IMPACTS

Aquaculture facilities typically employ a small workforce, with staff levels of 25 to 35 people or less. The need for workers to construct and operate these facilities is insignificant compared to the existing populations found along the coast in California. Because it is not a specialized industry requiring highly trained employees, the majority of the workforce would be composed of local hires. No growth inducing impacts would occur.

5.19 CUMULATIVE IMPACTS

Section 15130 (a) of the State CEQA Guidelines states that "an EIR shall discuss cumulative impacts of a project when they are significant." As defined in Section 15355, "cumulative impacts" refers to "two or more individual effects which when considered together, are considerable and which compound or increase other environmental impacts." Furthermore, Section 15130(b) states:

> *The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.*

For individual marine aquaculture projects, this assessment has noted that the areas in which potential environmental impacts may be most severe or are most likely to occur involve the resource categories of Biological Resources, Hydrology and Water Quality, and Aesthetics. The following list summarizes the potentially significant adverse impacts that are most likely to occur within these categories. The list also provides examples of other types of projects that may produce related impacts.

Resource Category	Potentially Significant Adverse Impact from Aquaculture Projects	Potential Other Projects Producing Related Impacts
Biological Resources	• Impact to sensitive species or sensitive habitat (such as eelgrass beds, benthic communities, wetlands or riparian habitat) displaced by project facilities	• Land development projects
	• Impact on natural aquatic populations due to accidental introduction of exotic species and/or exotic pathogens	• Shipping; agricultural imports; recreational boating
	• Impact on natural aquatic populations due to escapement and subsequent competition for habitat and food	• State and Federal fish stocking programs
Hydrology and Water Quality	• Altered flow conditions from placement of in-water structures	• Port projects; dock facilities
	• Water quality impact from discharge of excess feed and feces or from pond drawdown during harvest	• Other farm animal production projects
	• Temporary increase in siltation during facility construction	• Timber harvest; agriculture crop harvest; land development
Aesthetics	• Potential impact to scenic view or perceived visual character of an area	• Land development projects

The environmental resources most likely to be affected by marine aquaculture may also be affected by many other activities unrelated to aquaculture. Loss of sensitive habitat may be a challenge to nearly all projects involving land development in California. Issues involving wastewater discharges are common to many activities that require water for operations, including the agricultural industry and municipal development in general. Potential impacts involving sediment loading are likely to be experienced by any activity that involves substantial ground disturbance, including timber harvest, agriculture, and construction activities associated with land development. The risk of introducing exotic species and exotic pathogens is also present with the discharge of ballast water by the shipping industry, with the importation of agricultural products, and by small boats due to coastal travel of recreational and commercial fishing boats. Potential impacts to natural populations arising from competition for habitat and food is affected by State and Federal fish stocking programs to a much larger scale than is possible by the accidental release of incidental fish by the private aquaculture industry.

The potential cumulative impacts that encompass the California coastal marine aquaculture industry requires consideration of additional activities such as those described in the preceding paragraph that have potential to contribute related impacts. These activities include major land uses such as municipal development, agriculture, and forest practices, as well as fundamental recreational pastimes. Potential impacts

from these other activities are mitigated through adherence to relevant ordinances or regulations (such as general plans for municipal development) and through conditions imposed during the approval process for individual projects involving these other activities. As guided by the standards of practicality and reasonableness, it is assumed these other projects have been approved on the basis that their contribution to cumulative impacts has been rendered to be less than cumulatively considerable.

Regulations to mitigate potential cumulative impacts of the California aquaculture industry have been adopted by state legislation, primarily through Fish and Game Code 15102 and through CCR Title 14, Division 1, Chapter 9, Sections 235-245. Applications for aquaculture of specific species are reviewed by DFG to ensure that accidental release will not cause a resource problem. Approval for culture of exotic species with potential to live in the wild generally is not allowed, or is permitted only in secure facilities to minimize or eliminate escape, as is appropriate to the risk represented by the species at issue. Approval for culture of native and established species is generally given only after analysis of the status of the local native population, recognizing that some animals may escape the facility. With the thorough DFG review of these statewide aquaculture issues, in conjunction with local agency review to develop appropriate mitigation to address regional and site-specific issues, the aquaculture industry is not expected to contribute to any significant cumulative impacts.

5.20 MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Proposed marine aquaculture projects undergo considerable review by resource agencies to assure that appropriate mitigation is implemented to reduce potential significant impacts that may degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; reduce the number or restrict the range of a rare or endangered plant or animal; or eliminate important examples of the major periods of California history or prehistory. From a programmatic basis, these projects have no significant impact that is cumulatively considerable. Marine aquaculture projects have no impacts which will cause substantial adverse effects on human beings.

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SECTION 9. LIST OF ACRONYMS

AHD – Acoustic Harassment Device
APCD – Air Pollution Control District
APHIS – Animal and Plant Health Inspection Service within the U.S. Department of Agriculture
AQMD – Air Quality Management District
ARPA - Archeological Resources Protection Act
BOD – Biological Oxygen Demand
CARB – California Air Resources Board
CDFG – California Department of Fish and Game
CEQA – California Environmental Quality Act
COE – U.S. Army Corps of Engineers
CVM – Center for Veterinary Medicine
CWA – Clean Water Act
DHS – Department of Health Services
DO – Dissolved Oxygen
EIR – Environmental Impact Report
ESA – Endangered Species Act
FDA – U.S. Food and Drug Administration
HUD – Department of Housing and Urban Development
INAD – Investigational New Animal Drug
JARPA – Joint Aquatic Resources Permit Application
LCP – Local Coastal Plan
LRP – Low Regulatory Priority
LUP – Land Use Plan
NAAQS – National Ambient Air Quality Standards
NAHA – Native American Heritage Act
NAHC – Native American Heritage Commission
NEPA – National Environmental Policy Act
NHPA – National Historic Preservation Act
NMFS – National Marine Fisheries Service
NOD – Notice of Determination
NPDES – National Pollution Discharge Elimination System Permit
NRHP – National Register of Historic Places
NSSP – National Shellfish Sanitation Program
OSHA – Occupational Safety and Health Administration
PEIR – Program Environmental Impact Report
PSA – Permit Streamlining Act
RWQCB – Regional Water Quality Control Board
SAAQS – State Ambient Air Quality Standards
SHPO – State Historic Preservation Office
SLC – State Lands Commission
SWPPP – Storm Water Pollution Prevention Plan
SWRCB – State Water Resources Control Board
TSS – Total Suspended Solids
USEPA – U.S. Environmental Protection Agency
USFWS – U.S. Fish and Wildlife Service
WDF – Washington State Department of Fisheries
WDR – Waste Discharge Requirements

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